

INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS FOR

ALPINE™ CONDENSING HIGH EFFICIENCY DIRECT VENT *GAS - FIRED HOT WATER BOILER*



As an ENERGY STAR® Partner, Burnham Hydronics has determined that the Alpine™ Series meets the ENERGY STAR® guidelines for energy efficiency established by the United States Environmental Protection Agency (EPA).

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury, or loss of life. For assistance or additional information, consult a qualified installer, service agency or the gas supplier. This boiler requires a special venting system. Read these instructions carefully before installing.

 **Burnham®**
Hydronics
U.S. Boiler Company, Inc.

IMPORTANT INFORMATION - READ CAREFULLY

NOTE: The equipment shall be installed in accordance with those installation regulations enforced in the area where the installation is to be made. These regulations shall be carefully followed in all cases. Authorities having jurisdiction shall be consulted before installations are made.

All wiring on boilers installed in the USA shall be made in accordance with the National Electrical Code and/or local regulations. All wiring on boilers installed in Canada shall be made in accordance with the Canadian Electrical Code and/or local regulations.

The City of New York requires a Licensed Master Plumber supervise the installation of this product.

The Massachusetts Board of Plumbers and Gas Fitters has approved the Alpine™ Series boiler. See the Massachusetts Board of Plumbers and Gas Fitters website, http://license.reg.state.ma.us/pubLic/pb_pre_form.asp for the latest Approval Code or ask your local Sales Representative.

The Commonwealth of Massachusetts requires this product to be installed by a Licensed Plumber or Gas Fitter.

The following terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning product life.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury or substantial property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in moderate or minor injury or property damage.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE

Indicates special instructions on installation, operation, or maintenance which are important but not related to personal injury hazards.

DANGER

DO NOT store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.

If you smell gas vapors, **DO NOT** try to operate any appliance - **DO NOT** touch any electrical switch or use any phone in the building. Immediately, call the gas supplier from a remotely located phone. Follow the gas supplier's instructions or if the supplier is unavailable, contact the fire department.

WARNING

This boiler requires regular maintenance and service to operate safely. Follow the instructions contained in this manual.

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Read and understand the entire manual before attempting installation, start-up operation, or service. Installation and service must be performed only by an experienced, skilled, and knowledgeable installer or service agency

This boiler must be properly vented.

This boiler needs fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air.

The interior of the venting system must be inspected and cleaned before the start of the heating season and should be inspected periodically throughout the heating season for any obstructions. A clean and unobstructed venting system is necessary to allow noxious fumes that could cause injury or loss of life to vent safely and will contribute toward maintaining the boiler's efficiency.

Installation is not complete unless a pressure relief valve is installed into the tapping located on left side of appliance. - See the Water Piping and Trim Section of this manual for details.

This boiler is supplied with safety devices which may cause the boiler to shut down and not re-start without service. If damage due to frozen pipes is a possibility, the heating system should not be left unattended in cold weather; or appropriate safeguards and alarms should be installed on the heating system to prevent damage if the boiler is inoperative.

This boiler contains very hot water under high pressure. Do not unscrew any pipe fittings nor attempt to disconnect any components of this boiler without positively assuring the water is cool and has no pressure. Always wear protective clothing and equipment when installing, starting up or servicing this boiler to prevent scald injuries. Do not rely on the pressure and temperature gauges to determine the temperature and pressure of the boiler. This boiler contains components which become very hot when the boiler is operating. Do not touch any components unless they are cool.

Boiler materials of construction, products of combustion and the fuel contain alumina, silica, heavy metals, carbon monoxide, nitrogen oxides, aldehydes and/or other toxic or harmful substances which can cause death or serious injury and which are known to the state of California to cause cancer, birth defects and other reproductive harm. Always use proper safety clothing, respirators and equipment when servicing or working nearby the appliance.

Failure to follow all instructions in the proper order can cause personal injury or death. Read all instructions, including all those contained in component manufacturers manuals which are provided with the boiler before installing, starting up, operating, maintaining or servicing.

Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors or liquids.

All cover plates, enclosures and guards must be in place at all times.

NOTICE

This boiler has a limited warranty, a copy of which is printed on the back of this manual. It is the responsibility of the installing contractor to see that all controls are correctly installed and are operating properly when the installation is complete.

Table of Contents

I. Product Description, Specifications and Dimensional Data.....	4	VIII. Electrical.....	49
II. Pre-Installation.....	8	IX. Boiler Stacking.....	56
III. Unpacking Boiler	9	X. Modular Installation	58
IV. Venting.....	10	XI. System Start-up	66
V. Condensate Disposal	29	XII. Operation.....	72
VI. Water Piping and Trim	31	XIII. Service and Maintenance	84
VII. Gas Piping.....	46	XIV. Troubleshooting	88
		XV. Repair Parts	91

I. Product Description, Specifications and Dimensional Data

Alpine™ Series boilers are condensing high efficiency gas-fired direct vent hot water boilers designed for use in forced hot water space or space heating with indirect domestic hot water heating systems, where supply water temperature does not exceed 210°F. These boilers have special coil type stainless steel heat exchangers, constructed, tested and stamped per Section IV ‘Heating Boilers’ of

ASME Boiler and Pressure Vessel Code, which provide a maximum heat transfer and simultaneous protection against flue gas product corrosion. These boilers are not designed for use in gravity hot water space heating systems or systems containing significant amount of dissolved oxygen (swimming pool water heating, direct domestic hot water heating, etc.).

Table 1: Dimensional Data (See Figures 1A & 1B)

Dimension	Boiler Model					
	ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
A - Inch (mm)	12-9/16 (320)	14 (356)	19-11/16 (500)	23-15/16 (608)	21-13/16 (554)	28-7/8 (734)
B - Inch (mm)	5-5/8 (142)	5-13/16 (147)			7-5/16 (185)	6-3/16 (157)
C - Inch (mm)	7-5/16 (186)				14-1/8 (358)	13-1/16 (332)
D - Inch (mm)	9-5/16 (237)	10-3/4 (273)	16-7/16 (417)	17-1/8 (435)	18 (456)	23-3/4 (602)
E - Inch (mm)	5-15/16 (151)				12-1/4 (312)	15-13/16 (402)
Gas Inlet F (FPT)	1/2"				3/4"	1"
Return G (FPT)	1"				1-1/4"	1-1/2"
Supply H (FPT)	1"				1-1/4"	1-1/2"
Condensate Drain J *	* Factory Provided Socket End Compression Pipe Joining Clamp for 3/4" Schedule 40 PVC Pipe					
Boiler Two Pipe CPVC/PVC Vent Connector - Inch	3 x 3		3 x 4		4 x 4	
Approx. Shipping Weight (LBS)	137	155	182	206	256	304

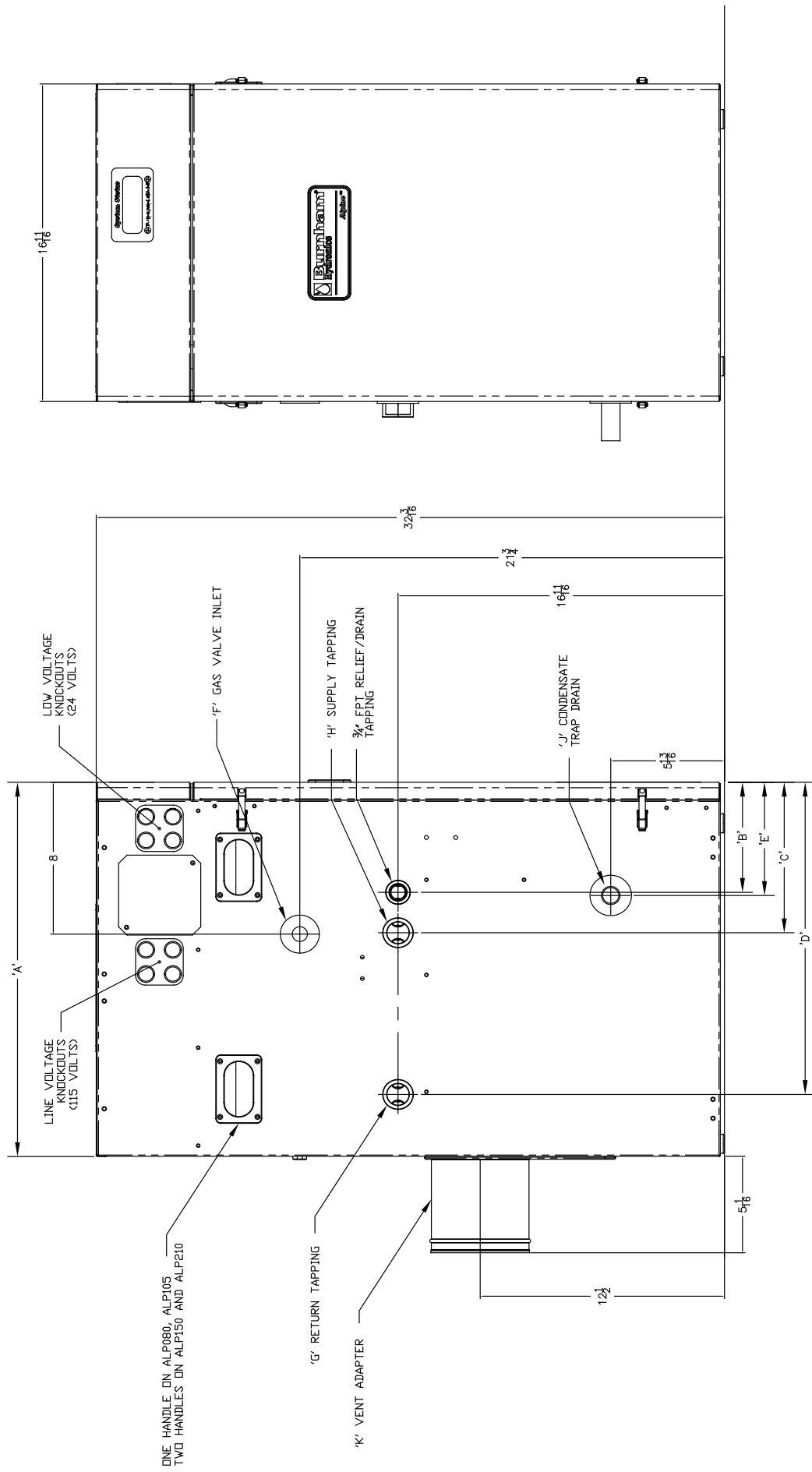


Figure 1A: Alpine™ - Models ALP080 thru ALP210

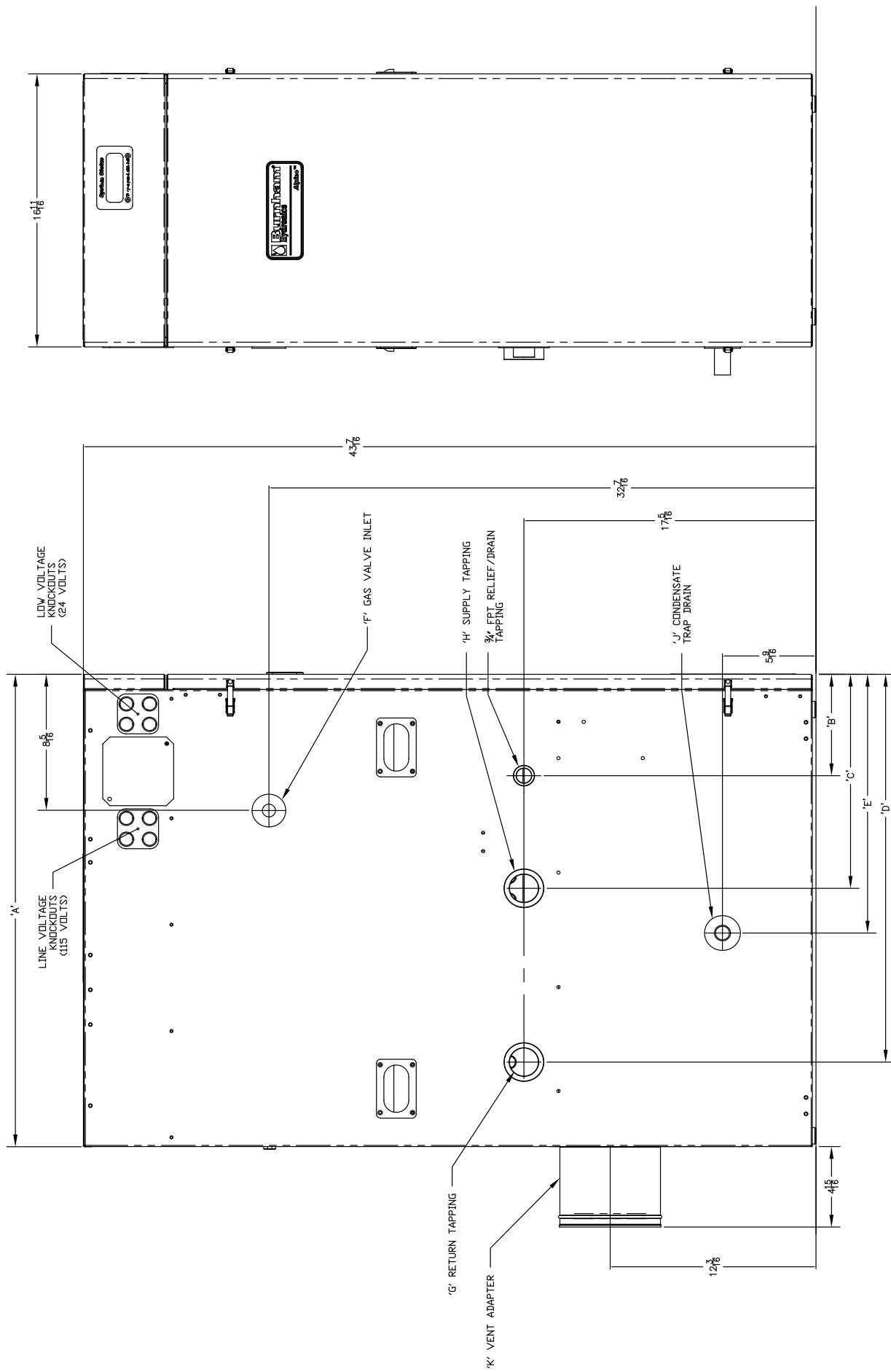


Figure 1B: Alpine™ - Models ALP285 thru ALP399

Table 2A: Rating Data - Models ALP080 thru ALP399 (0 to 2000 Feet Elevation Above Sea Level)





			Alpine Series Gas-Fired Boilers						
* Model Number	Input (MBH)		** Output (MBH)	Net I=B=R Ratings Water (MBH)	AFUE %	Thermal Efficiency (%)	Combustion Efficiency (%)	Boiler Water Volume (Gal.)	Heat Transfer Area (Sq. Ft.)
	Min.	Max.							
ALP080	16	80	73	63	95			0.6	7.3
ALP105	21	105	96	83	95			0.7	9.1
ALP150	30	150	138	120	95			1.3	16.4
ALP210	42	210	194	169	95			1.7	21.8
ALP285	57	285	265	230	95			2.4	29.1
ALP399	80	399	377	328		94.1	94.5	3.4	41.8
* Add Suffix "N" for Natural Gas or Suffix "P" for LP Gas Models.									
<p>Notes: ** DOE Heating Capacity (ALP080 thru ALP285); Gross Output (ALP399) Maximum Working Pressure, Water - 30 PSI Shipped from Factory (std.); 50 PSI - Optional (ALP080 thru ALP285) Maximum Working Pressure, Water - 50 PSI Shipped from Factory (std.); (ALP399) Maximum Allowable Temperature, Water - 210°F Boilers are factory shipped as Natural Gas builds and have to be field adjusted for LP gas application. Refer to 'System Start-Up Section of this manual for detailed procedure.</p> <p>Ratings shown are for installations at sea level and elevations up to 2000 Feet. For elevations above 2000 Feet, ratings should be reduced at the rate of four percent (4%) for each 1000 Feet above sea level.</p>									

Table 2B: Rating Data - Models ALP080 thru ALP399 (2001 to 7000 Feet Elevation Above Sea Level)

			Alpine Series Gas-Fired Boilers							
Model Number *	Input (MBH)		** Output (MBH)	Net I=B=R Ratings Water (MBH)	AFUE %	Thermal Efficiency (%)	Combustion Efficiency (%)	Boiler Water Volume (Gal.)	Heat Transfer Area (Sq. Ft.)	
	Min.	Max.								
ALP080	27	80	73	63	95			0.6	7.3	
ALP105	35	105	96	83	95			0.7	9.1	
ALP150	50	150	138	120	95			1.3	16.4	
ALP210	70	210	194	169	95			1.7	21.8	
ALP285	57	285	265	230	95			2.4	29.1	
ALP399	80	399	377	328		94.1	94.5	3.4	41.8	
* Add Suffix "N" for Natural Gas or Suffix "P" for LP Gas Models.										
Notes: ** DOE Heating Capacity (ALP080 thru ALP285); Gross Output (ALP399) Maximum Working Pressure, Water - 30 PSI Shipped from Factory (std.); 50 PSI - Optional Maximum Allowable Temperature, Water - 210°F Boilers are factory shipped as Natural Gas builds and have to be field adjusted for LP gas application. Refer to 'System Start-Up Section of this manual for detailed procedure. For elevations above 2000 Feet, ratings should be reduced at the rate of four percent (4%) for each 1000 Feet above sea level.										

II. Pre-Installation

WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage or personal injury.

DANGER

Do not install boiler where gasoline or other flammable vapors or liquids, or sources of hydrocarbons (i.e. bleaches, cleaners, chemicals, sprays, paint removers, fabric softeners, etc.) are used or stored.

NOTICE

Due to the low water content of the boiler, mis-sizing of the boiler with regard to the heating system load will result in excessive boiler cycling and accelerated component failure. Burnham DOES NOT warrant failures caused by mis-sized boiler applications. DO NOT oversize the boiler to the system. Modular boiler installations greatly reduce the likelihood of boiler oversizing.

- A. Installation must conform** to the requirements of the authority having jurisdiction. In the absence of such requirements, installation must conform to the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1, and/or CAN/CSA B149.1 Installation Codes.
- B. Appliance is design certified** for installation on combustible flooring. Do not install boiler on carpeting.
- C. Provide clearance** between boiler jacket and combustible material in accordance with local fire ordinance. Refer to Figure 2 for minimum listed clearances from combustible material. Recommended service clearance is 24 inches from left side, front, top and rear of the boiler. Recommended front clearance may be reduced to the combustible material clearance providing:
1. Access to boiler front is provided through a door or removable front access panel.

2. Access is provided to the condensate trap located underneath the heat exchanger.

- D. Install on level floor.** For basement installation provide a solid base such as concrete, if floor is not level or if water may be encountered on floor around boiler. Floor must be able to support weight of boiler, water and all additional system components.
- E. Protect gas ignition system components** from water (dripping, spraying, rain, etc.) during boiler operation and service (circulator replacement, condensate trap, control replacement, etc.).
- F. Provide combustion and ventilation air** in accordance with applicable provisions of local building codes, or: USA - *National Fuel Gas Code*, NFPA 54/ANSI Z223.1, Air for Combustion and Ventilation; Canada - *Natural Gas and Propane Installation Code*, CAN/CSA-B149.1, Venting Systems and Air Supply for Appliances.

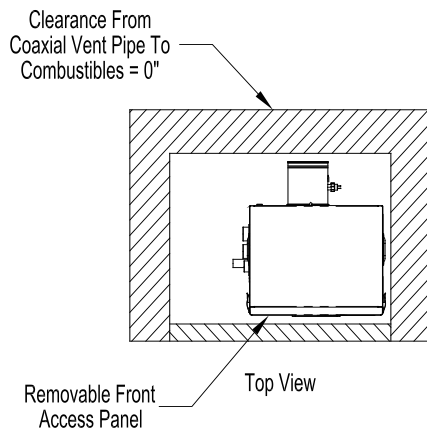
WARNING

Adequate combustion and ventilation air must be provided to assure proper combustion.

- G. The boiler should be located** so as to minimize the length of the vent system. The PVC combustion air piping, or the optional concentric vent piping, containing integral combustion air inlet piping, must terminate where outdoor air is available for combustion and away from areas that may contaminate combustion air. In particular, avoid areas near chemical products containing chlorines, chloro/fluorocarbons, paint removers, cleaning solvents and detergents. Avoid areas containing saw dust, loose insulation fibers, dry wall dust etc.

CAUTION

Avoid operating this boiler in an environment where saw dust, loose insulation fibers, dry wall dust, etc. are present. If boiler is operated under these conditions, the burner interior and ports must be cleaned and inspected daily to insure proper operation.



CLEARANCES TO COMBUSTIBLE & NON-COMBUSTIBLE CONSTRUCTION:

THIS BOILER IS APPROVED FOR CLOSET INSTALLATION WITH THE FOLLOWING CLEARANCES: TOP = 1", FRONT = 1", LEFT SIDE = 10", RIGHT SIDE = 2", REAR = 6".

RECOMMENDED SERVICE CLEARANCES:

TOP = 24", FRONT = 24", LEFT SIDE = 24", BACK = 24"

THESE SERVICE CLEARANCES ARE RECOMMENDED, BUT MAY BE REDUCED TO THE COMBUSTIBLE CLEARANCES PROVIDED:

1. ACCESS TO THE FRONT OF THE BOILER IS PROVIDED THROUGH A DOOR.
2. ACCESS IS PROVIDED TO THE CONDENSATE TRAP AND TRANSFORMER LOCATED ON THE LEFT SIDE OF THE BOILER.

* NOTE: WHEN BOILER IS VENTED VERTICALLY, THE MINIMUM CLEARANCE FROM THE BACK OF THE JACKET IS INCREASED TO 15" WITH A SHORT RADIUS ELBOW AND 18" WITH A LONG RADIUS ELBOW.

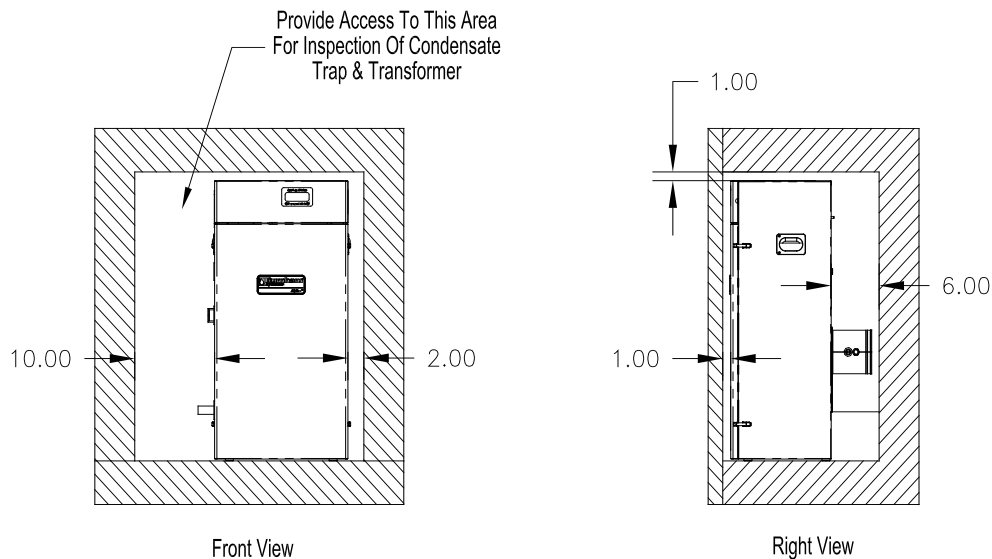


Figure 2: Clearances To Combustible and Non-combustible Material

III. Unpacking Boiler

CAUTION

Do not drop boiler.

- A. Move boiler to approximate installed position.
- B. Remove all crate fasteners.
- C. Lift and remove outside container.

- D. Remove boiler from cardboard positioning sleeve on shipping skid.

WARNING

Installation of this boiler should be undertaken only by trained and skilled personnel from a qualified service agency.

- E. Move boiler to its permanent location.

IV. Venting

WARNING

Failure to vent this boiler in accordance with these instructions could cause products of combustion to enter the building resulting in severe property damage, personal injury or death.

Do not interchange vent systems or materials unless otherwise specified.

The use of thermal insulation covering pipe and fittings is prohibited.

Do not use a barometric damper, draft hood or vent damper with this boiler.

The use of CPVC is required when venting in chase ways and through interior wall penetrations.

Do not locate vent termination where exposed to prevailing winds. Moisture and ice may form on surface around vent termination. To prevent deterioration, surface must be in good repair (sealed, painted, etc.).

Do not locate vent termination where chlorines, chloro/fluorocarbons (CFC's), petroleum distillates, detergents, volatile vapors or other chemicals are present. Severe boiler corrosion and failure will result.

The use of cellular core PVC (ASTM F891) is prohibited.

Do not locate vent termination under a deck.

Do not reduce size of vent/combustion air pipe diameter.

When installing vent pipe through chimney, no other appliance can be vented into the chimney.

Do not allow low spots in the vent where condensate may pool.

A. Vent Guidelines Due to Removal of an Existing Boiler

For installations not involving the replacement of an existing boiler, proceed to Step B.

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the remaining appliances. At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation:

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range-hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

4. Place in operation the appliance being inspected. Follow the Lighting (or Operating) Instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after five (5) minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous conditions of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part II in the *National Fuel Gas Code*, NFPA 54/ANSI Z223.1.

B. General Guidelines

1. Vent system installation must be in accordance with *National Fuel Gas Code*, NFPA 54/ANSI Z221.3 or applicable provisions of local building codes. Contact local building or fire officials about restrictions and installation inspection in your area.

2. The Alpine™ is designed to be installed as a Direct Vent boiler. The air for combustion is supplied directly to the burner enclosure from outdoors and flue gases are vented directly outdoors (through wall or roof).
3. The following combustion air/vent system options are approved for use with the Alpine™ boilers:
 - i. **Two-Pipe CPVC/PVC Gas Vent/Combustion Air System (factory standard)** - separate CPVC/PVC pipe serves to expel products of combustion and separate PVC pipe delivers fresh outdoor combustion air. Refer to Paragraph C through F for specific details.
 - ii. **Combination Concentric Gas Vent/Combustion Air Inlet (optional)** - the assembly consists of inner fire resistant polypropylene vent pipe and outer steel pipe casing. The inner pipe serves as conduit to expel products of combustion, while outdoor fresh combustion air is drawn through the space between the inner and outer pipes. Refer to Paragraphs G through P for specific details.
4. Refer to Table 3 and the appropriate drawings to determine the proper configuration of either factory standard or optional venting/combustion air system details.

C. The following information is applicable for Two-Pipe CPVC/PVC Gas Vent/Combustion Air System (factory standard).

WARNING

All CPVC vent components (supplied with boiler) must be used for near-boiler vent piping before transitioning to Schedule 40 PVC pipe (ASTM 2665) components for remainder of vent system. CPVC vent components must be used prior to exit of any closet or confined space.

See Table 6 for complete list of Burnham Vent System Components. Use single wall thimble [Burnham Part No. 102180-01 (3"), 102181-01 (4")] when penetrating a combustible wall for vent only.

1. Horizontal vent pipe must maintain a minimum ¼ inch per foot slope down towards boiler.
2. Use noncombustible ¾ inch pipe strap to support horizontal runs and maintain vent location and slope while preventing sags in pipe. Maximum support spacing is four (4) feet. Avoid low spots where condensate may pool. Do not penetrate any part of the vent system with fasteners.

WARNING

All condensate that forms in the vent must be able to drain back to the boiler.

3. Vent length restrictions are based on equivalent length of vent/combustion air pipe (total length of straight pipe plus equivalent length of fittings). Maximum vent/combustion air lengths are listed in Table 7. Do not exceed maximum vent/combustion air lengths. Table 6 lists equivalent lengths for fittings. Do not include vent/combustion air terminals in equivalent feet calculations. See "Combustion Air/Vent, Equivalent Length Work Sheet".
4. Provide minimum service clearance between boiler back and concentric vent exiting through outside wall, for concentric vent installation/replacement and/or flue temperature sensor service/replacement.
5. Do not install venting system components on the exterior of the building except as specifically required by these instructions. The vent termination location is restricted as follows (refer to Figures 6 and 9):
 - a. Minimum twelve (12) inches above grade plus normally expected snow accumulation level, or seven (7) feet above grade, if located adjacent

Table 3: Combustion Air/Vent System Options

Option	Description	Additional Vent Kit Required	Components Included with Boiler	Installation Drawing and Specification
TWO-PIPE CPVC/PVC HORIZONTAL	Direct Vent (sealed combustion) with both the vent pipe and combustion air pipe terminating horizontally (through a sidewall) with individual penetrations for the vent and combustion air piping and terminals.	No	See Table 4	See Figure 6
TWO-PIPE CPVC/PVC VERTICAL	Direct Vent (sealed combustion) with both the vent pipe and combustion air pipe terminating vertically (through the roof) with individual penetrations for the vent and combustion air piping and terminals.	No	See Table 4	See Figures 9 and 10
CONCENTRIC HORIZONTAL	Direct Vent (sealed combustion) the concentric vent pipe terminates horizontally (through a sidewall).	No	See Table 9	See Figure 13
CONCENTRIC VERTICAL	Direct Vent (sealed combustion) the concentric vent pipe terminates vertically (through the roof).	Yes	See Table 9	See Figure 19

Table 4: Vent System Components Included with Boiler

Vent System Components	Part Number	Quantity		
		ALP080 & ALP105 (P/N 102189-01)	ALP150 & ALP210 (P/N 102189-02)	ALP285 & ALP399 (P/N 102189-03)
3" Schedule 40 PVC Tee Combustion Air/Vent Terminal	102190-01	2	1	---
4" Schedule 40 PVC Tee Combustion Air/Vent Terminal	102190-02	---	1	2
3" Stainless Steel Rodent Screens	102191-01	2	1	---
4" Stainless Steel Rodent Screens	102191-02	---	1	2
3" x 30" Schedule 40 CPVC Pipe	102193-01	1	1	---
4" x 30" Schedule 40 CPVC Pipe	102193-02	---	---	1
3" Schedule 80 CPVC 90° Elbow	102192-01	1	1	---
4" Schedule 80 CPVC 90° Elbow	102192-02	---	---	1
8 oz. Bottle of Transition Cement	102195-01	1	1	1
8 oz. Bottle of Primer	102194-01	1	1	1
Burnham Vent Supplement Manual	102188-01	1	1	1
Two Pipe Vent System Connector for CPVC/PVC	102183-01	1	---	---
Two Pipe Vent System Connector for CPVC/PVC	102183-02	---	1	---
Two Pipe Vent System Connector for CPVC/PVC	102183-03	---	---	1
Two Pipe Vent System Connector for CPVC/PVC Gasket	102185-01	1	1	---
Two Pipe Vent System Connector for CPVC/PVC Gasket	102185-02	---	---	1
Silicone Vent Sensor Cap	102153-01	1	1	1

Table 5: Clearances from Vent Piping to Combustible Material

Vent Pipe	Pipe Direction	Enclosure	Minimum Clearance To Combustible Material, Inches
CPVC/PVC Venting	Vertical or Horizontal	Enclosed at all Sides	1" Vent/0" Combustion Air

Table 6: Burnham Vent System and Combustion Air System Components

Vent System Component	Equivalent Length (Ft.)
3" Schedule 40 CPVC Pipe x 30 Inches	2.5
4" Schedule 40 CPVC Pipe x 30 Inches	2.5
3" Schedule 80 CPVC 90° Elbow	5
4" Schedule 80 CPVC 90° Elbow	5

Maximum Number of 90's and Straight Pipe											
Vent Pipe	# of 90's	1	2	3	4	5	6	7	8	9	10
	Feet of Pipe	55	50	45	40	35	30	25	20	15	10
Combustion Air Pipe	# of 90's	1	2	3	4	5	6	7	8	9	10
	Feet of Pipe	55	50	45	40	35	30	25	20	15	10

Combustion Air System Component (Parts by Others)	Equivalent Feet of Pipe*
3" or 4" ID Pipe x 1 Ft.	1
3" or 4" ID Pipe x 2 Ft.	2
3" or 4" ID Pipe x 4 Ft.	4
3" or 4" ID Pipe x 5 Ft.	5
3" or 4" 90° Elbow	5
3" or 4" 45° Elbow	5

*Equivalent Feet of Pipe Based on Standard 4" PVC Design

to public walkway. Do not install over public walkway where local experience indicates appliance flue gas vapor or condensate creates a nuisance or hazard.

- Minimum three (3) feet above any forced combustion air located within ten (10) feet.
- Direct Vent - Minimum one (1) foot below, one (1) foot horizontally from, or one (1) foot above any door, window, or gravity air inlet.
- Minimum four (4) feet horizontally from electric meters, gas meters, regulators, and relief valves.

This distance may be reduced if equipment is protected from damage due to condensation or vapor by enclosure, overhangs, etc.

- Minimum twelve (12) inches from overhang or corner of building.
- Enclose vent passing through occupied or unoccupied spaces above the boiler with material having a fire resistance rating of at least equal to the rating of the adjoining floor or ceiling. Maintain minimum clearances to combustible materials. See Figure 2 and Table 5 for details.

Table 7: Vent/Combustion Air Pipe Length

Boiler Model	3" Combustion Air Pipe (Equivalent Length)		4" Combustion Air Pipe (Equivalent Length)		3" Vent Pipe (Equivalent Length)		4" Vent Pipe (Equivalent Length)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
ALP080	21-7/8 In.	60 Ft.	---	---	21-7/8 In.	60 Ft.	---	---
ALP105	21-7/8 In.	60 Ft.	---	---	21-7/8 In.	60 Ft.	---	---
ALP150	---	---	21-7/8 In.	60 Ft.	21-7/8 In.	60 Ft.	---	---
ALP210	---	---	21-7/8 In.	60 Ft.	21-7/8 In.	60 Ft.	---	---
ALP285	---	---	32 In.	60 Ft.	---	---	32 In.	60 Ft.
ALP399	---	---	32 In.	60 Ft.	---	---	32 In.	60 Ft.

Combustion Air/Vent, Equivalent Length Work Sheet

This sheet is supplied to assist in vent/combustion air, equivalent length calculating

Combustion Air		Vent	
90° elbow(s) PVC		Supplied 30" straight CPVC	
Quantity = <input type="text"/>	x 5' = <input type="text"/> equiv. ft. a.	Length ft. = <input type="text"/> 2.5	x 1 = <input type="text"/> 2.5 equiv. ft. a.
45° elbow(s) PVC		Supplied 90° elbow CPVC	
Quantity = <input type="text"/>	x 2.5' = <input type="text"/> equiv. ft. b.	Quantity = <input type="text"/> 1	x 5' = <input type="text"/> 5 equiv. ft. b.
Straight pipe PVC		90° elbow(s) PVC	
Length ft. = <input type="text"/>	x 1 = <input type="text"/> equiv. ft. c.	Quantity = <input type="text"/>	x 5' = <input type="text"/> equiv. ft. c.
		45° elbow(s) PVC	
		Quantity = <input type="text"/>	x 2.5' = <input type="text"/> equiv. ft. d.
		Straight pipe PVC	
		Length ft. = <input type="text"/>	x 1 = <input type="text"/> equiv. ft. e.
Total*	a.+b.+c. = <input type="text"/> equiv. ft.	Total*	a.+b.+c.+d.+e.= <input type="text"/> equiv. ft.

* Total cannot exceed 60 equiv. ft. length.

Vent and combustion air terminals do not count towards total equiv. ft.

Note: For one or two family dwellings, fire resistance rating requirement may not need to be met, but is recommended.

- Plan venting system to avoid possible contact with plumbing or electrical wires. Start at vent connector at rear of boiler and work towards vent termination.
- Design the Vent System to allow a 3/8" of thermal expansion per 10 feet of CPVC/PVC pipe. Runs of 20 ft. or longer that are restrained at both ends must use an offset or expansion loop. Refer to Figure 3.
- Follow all manufacturer instructions and warnings when preparing pipe ends for joining and using the primer and the cement.

D. Installation of Two-Pipe CPVC/PVC Gas Vent/Combustion Air System Connector

The boiler two pipe vent system connector for CPVC/PVC and gasket are shipped inside the vent carton. The

vent connector mounting hardware - six (6) #8 x 1/2" black oxide round head Phillips sheet metal screws - are shipped inside Miscellaneous Part Carton.

- Remove the vent connector and gasket from the vent carton.
- Locate six mounting screws.
- Position the vent connector and gasket onto jacket combination rear/bottom panel and insert vent connector inner stainless steel vent pipe into the heat exchanger vent outlet.
- Align vent connector plate and gasket clearance holes with rear/bottom panel engagement holes; then secure the collar and gasket to rear/bottom panel with six mounting screws. See Figure 4.
- Flue temperature sensor, factory attached to the boiler wiring harness, is secured to the boiler rear/bottom panel with tape.

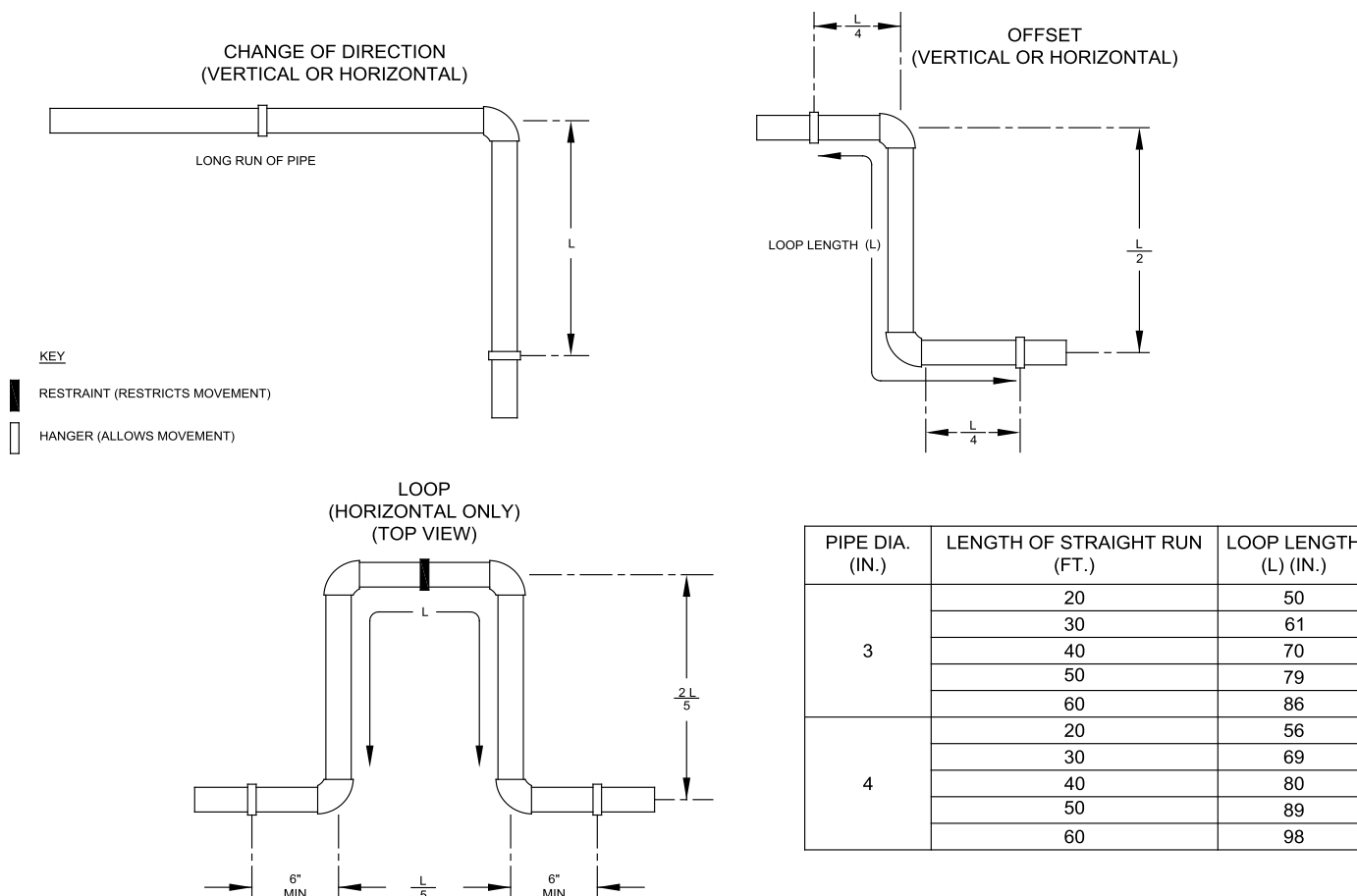


Figure 3: Expansion Loop and Offset

6. Remove the Silicone flue sensor cap from the vent carton and press onto the two pipe vent system connector for CPVC/PVC sensor port. Remove the tape holding the flue sensor and insert the flue temperature sensor into the flue sensor plug until it is firmly engaged. See Figure 4.

7. Near-Boiler Vent Piping (see Figure 5):

WARNING

All CPVC vent components (supplied with boiler) must be used for near-boiler vent piping before transitioning to Schedule 40 PVC pipe (ASTM 2665) components for remainder of vent system.

- a. All CPVC vent components (supplied with boiler), 30" straight and 90° elbow, must be used for near-boiler piping before transitioning to Schedule 40 PVC (ASTM 2665) pipe components for remainder of vent system. The CPVC 30" straight section may be cut to accommodate desired vent configuration for near-boiler piping, provided both pieces are used in conjunction with the CPVC 90° elbow, before any PVC components are used. Ensure that the CPVC elbow is the first elbow used in the vent system as it exits the boiler.

- b. Clean all vent and combustion air pipe joints with primer and secure with transition cement, (8 oz. bottle of primer and 8 oz. bottle of transition cement supplied with boiler). Follow the instructions provided on the primer and cement.

E. CPVC/PVC Horizontal Venting System

See Figures 3 thru 8.

Vent Piping - Horizontal

1. See Paragraph D for instructions on attaching the vent system connector to the boiler.
2. Do not exceed maximum vent length. Refer to Table 7 for pipe diameters and allowable lengths.
3. Horizontal vent pipe must maintain a minimum 1/4 inch per foot slope down towards boiler.
4. Use appropriately designed thimbles when passing through combustible walls (thimble use is optional for noncombustible walls). Insert thimble through wall from outside. Secure outside flange to wall with nails or screws, and seal ID, OD and vent holes with sealant material. Install inside flange to inside wall, secure with nails or screws, and seal with sealant material.
5. For noncombustible wall application when thimble is not used, size opening such that a minimal clearance is obtained.

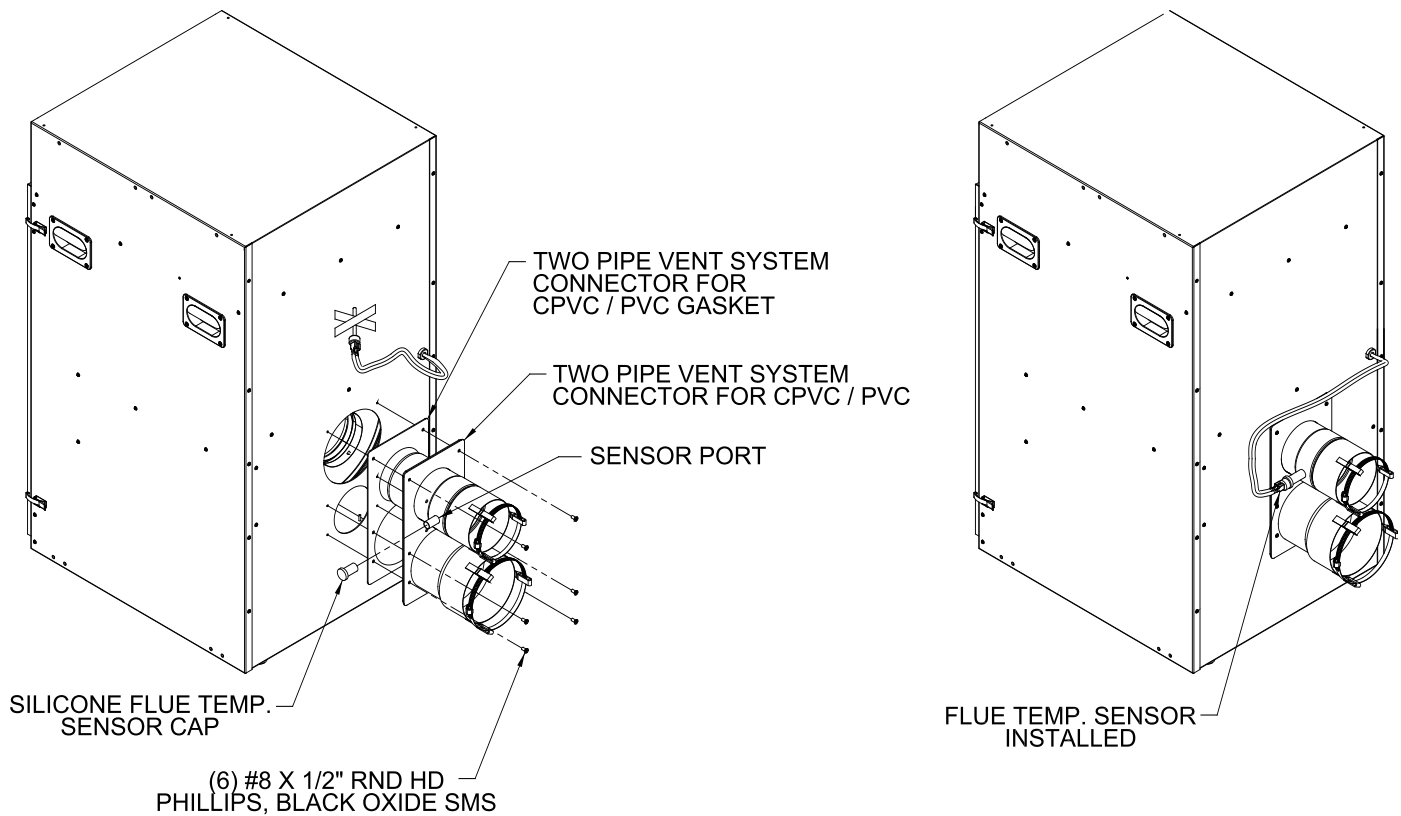


Figure 4: Field Installation of Two Pipe Vent System Connector for CPVC/PVC

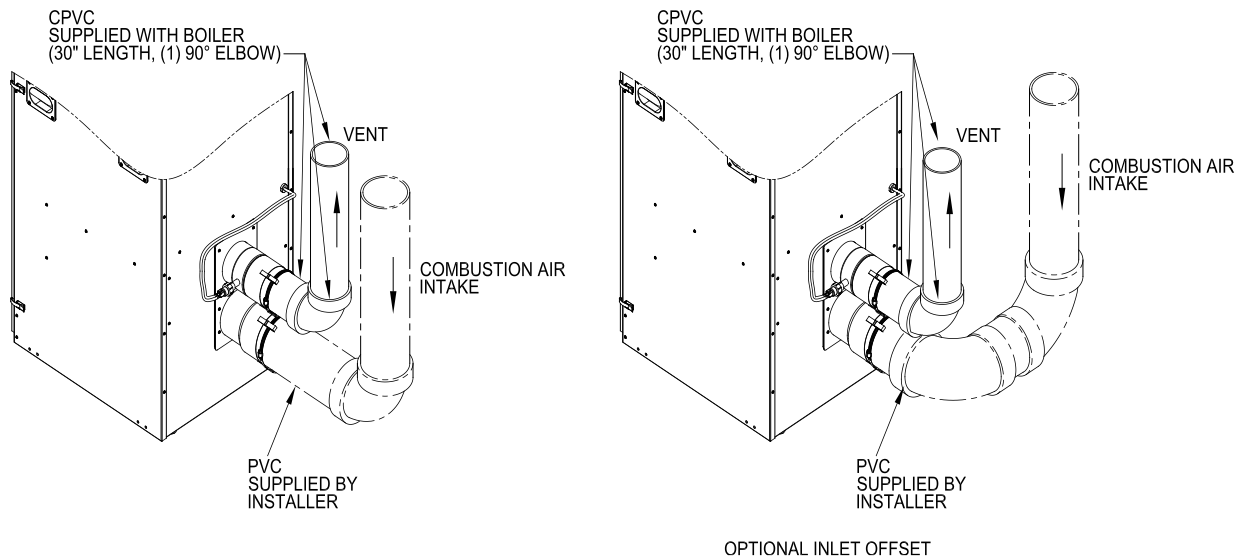


Figure 5: Near-Boiler Vent/Combustion Air Piping

6. Install Rodent Screen and Vent Terminal (supplied with boiler), see Figure 8 for appropriate configuration.
7. Apply sealant between vent pipe and opening/thimble to provide weather-tight seal. Sealant should not restrain the expansion of the vent pipe.

Combustion Air Piping - Horizontal

1. See Paragraph D for instructions on attaching the vent system connector to the boiler.
2. Do not exceed maximum combustion air length. Refer to Table 7 for pipe diameters and allowable lengths.

3. Horizontal combustion air pipe must maintain a minimum $\frac{1}{4}$ inch per foot slope down towards terminal, when possible. If not, slope toward boiler.
4. It is strongly recommended to locate the combustion air terminal on the same wall as the vent termination to prevent nuisance boiler shutdowns. Combustion air terminal can be installed closer to wall than vent.
5. Start at vent connector (rear boiler jacket) and work towards the combustion air terminal.
6. Size combustion air wall penetration to allow easy insertion of combustion air piping.

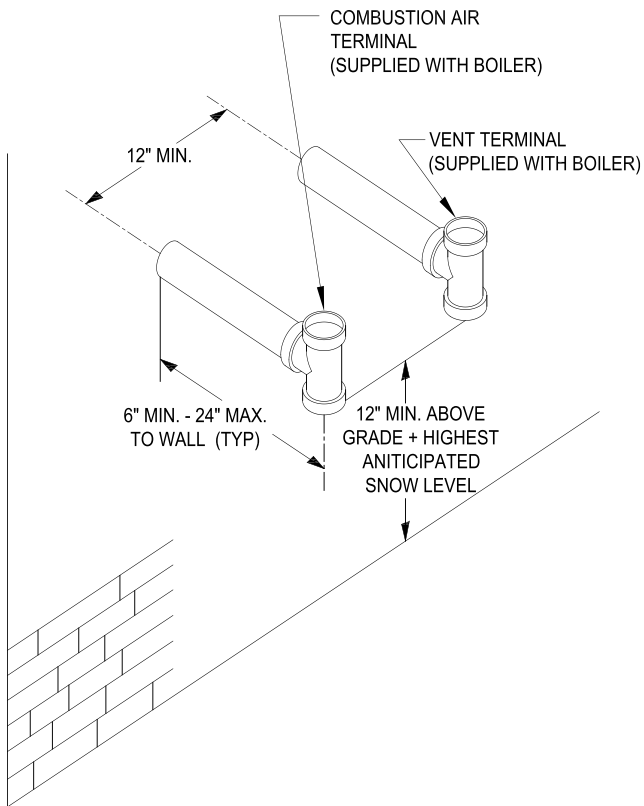


Figure 6 : Direct Vent - Side Wall Terminations

7. Install Rodent Screen and Combustion Air Terminal (supplied with boiler), see Figure 8 for appropriate configuration.
8. Apply sealant between vent pipe and opening to provide weather-tight seal

F. CPVC/PVC Vertical Venting System

Refer to Figures 3, 4, 5, 8, 9 & 10.

NOTICE

Roof penetrations require the use of roof flashing and storm collar that are not supplied with boiler.

Vent Piping - Vertical

1. See Paragraph D for instructions on attaching the vent system connector to the boiler.
2. Do not exceed maximum vent length. Refer to Table 7 for pipe diameters and allowable lengths.
3. Horizontal vent pipe must maintain a minimum 1/4 inch per foot slope down towards boiler.
4. Install fire stops where vent passes through floors, ceilings or framed walls. The fire stop must close the opening between the vent pipe and the structure.
5. Whenever possible, install vent straight through the roof. Refer to Figures 9 and 10.

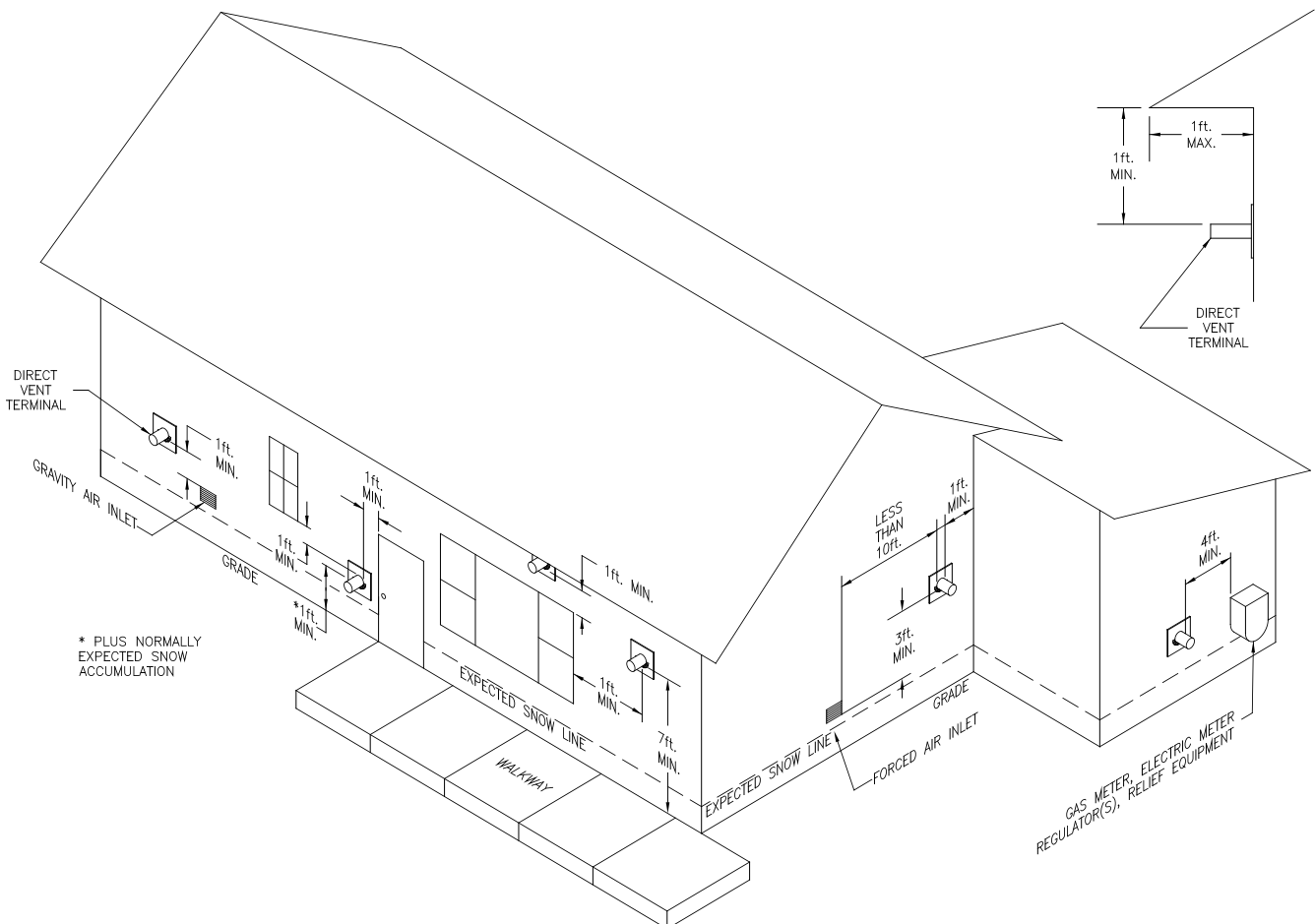


Figure 7: Location of Vent Terminal Relative to Windows, Doors, Grades, Overhangs, Meters and Forced Air Inlets (Combustion Air Terminal not shown)

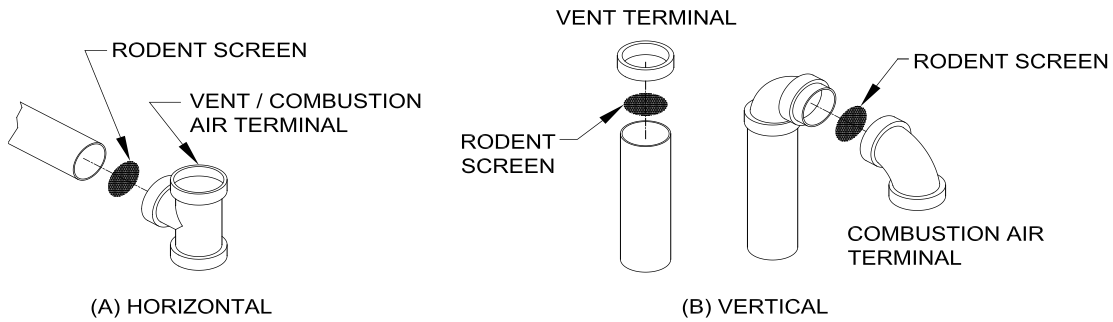


Figure 8: Rodent Screen Installation

- Size roof opening to maintain minimum clearance of 1 inch from combustible materials.
- Extend vent pipe to maintain minimum vertical and horizontal distance of twelve (12) inches from roof surface. Allow additional vertical distance for expected snow accumulation. Provide brace as required.

CAUTION

Vertical venting requires the use of roof flashing and a storm collar to prevent moisture from entering the structure.

- Install storm collar on vent pipe immediately above flashing. Apply Dow Corning Silastic 732 RTV Sealant between vent pipe and storm collar to provide weather-tight seal.
- Install Rodent Screen and Vent Terminal (supplied with boiler), see Figure 8 for appropriate configuration.

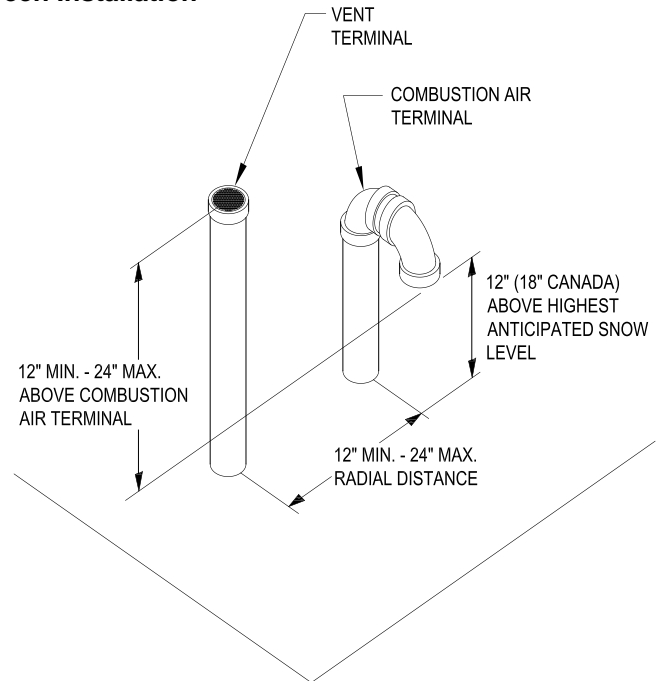


Figure 9: Direct Vent - Vertical Terminations

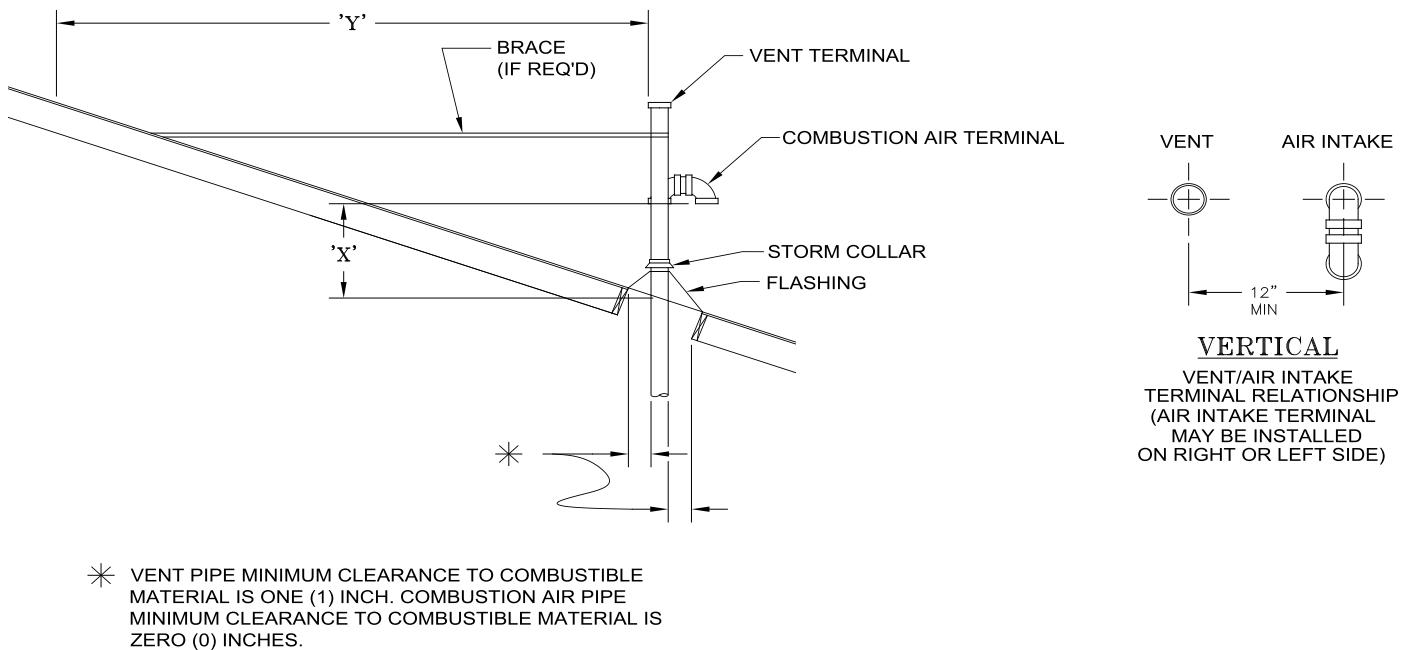


Figure 10: Direct Vent - Vertical Terminations with Sloped Roof

Extend vent/combustion air piping to maintain minimum vertical ('X') and minimum horizontal ('Y') distance of twelve (12) inches (18 inches Canada) from roof surface. Allow additional vertical ('X') distance for expected snow accumulation.

7. Brace exterior piping if required.

Combustion Air Piping - Vertical

1. See Paragraph D for instructions on attaching the vent system connector to the boiler.
2. Do not exceed maximum combustion air length. Refer to Table 7 for pipe diameters and allowable lengths.
3. Horizontal combustion air pipe must maintain a minimum ¼ inch per foot slope down towards boiler.
4. Locate combustion air termination on the same roof location as the vent termination to prevent nuisance boiler shutdowns. Combustion air terminal can be installed closer to roof than vent.
5. Start at vent connector on burner enclosure (rear boiler jacket) and work towards the combustion air terminal.
6. Size roof opening to allow easy insertion of combustion air piping and allow proper installation of flashing and storm collar to prevent moisture from entering the structure.
 - a. Use appropriately designed vent flashing when passing through roofs. Follow flashing manufacturers' instructions for installation procedures.
 - b. Extend combustion air pipe to maintain minimum vertical and horizontal distance of twelve (12) inches from roof surface. Allow additional vertical distance for expected snow accumulation. Provide brace as required.
 - c. Install storm collar on combustion air pipe immediately above flashing. Apply Dow Corning Silastic 732 RTV Sealant between combustion air pipe and storm collar to provide weather-tight seal.
7. Install Rodent Screen and Combustion Air Terminal (supplied with boiler), see Figure 8 for appropriate configuration.
8. Brace exterior piping if required.

G. Optional Snorkel CPVC/PVC Horizontal Vent System

Refer to Figures 3, 4, 5, 7, 8 and 11.

This installation will allow a maximum of seven (7) feet vertical exterior run of the vent/combustion air piping to be installed on the CPVC/PVC horizontal venting application (Section E).

NOTICE

Exterior run to be included in equivalent vent/combustion air lengths.

Vent Piping - Snorkel

1. See Paragraph D for instructions on attaching the vent system connector to the boiler.
2. Do not exceed maximum vent length. Refer to Table 7 for pipe diameters and allowable lengths.
3. Horizontal vent pipe must maintain a minimum ¼ inch per foot slope down towards boiler
4. After penetrating wall/thimble, install a Schedule 40 PVC 90° elbow so that the elbow leg is in the up direction.
5. Install maximum vertical run of seven (7) feet of Schedule 40 PVC vent pipe. See Figure 11.

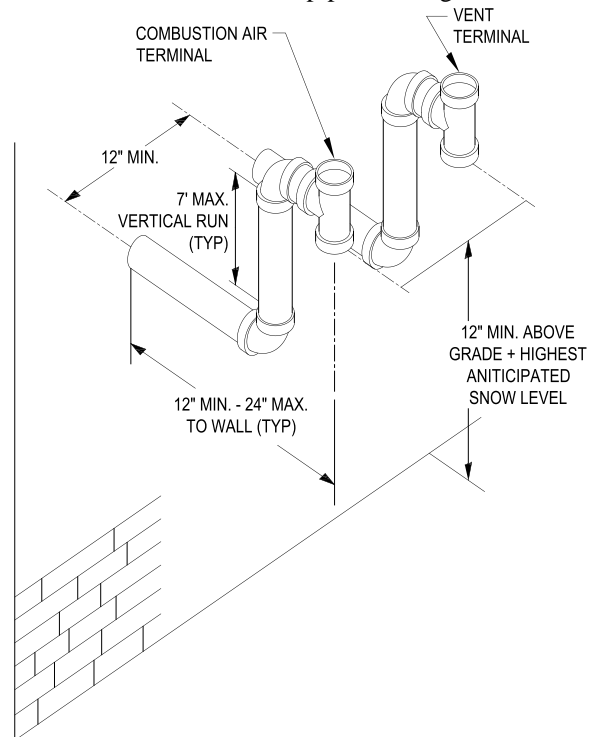


Figure 11: Direct Vent - Optional Side Wall Snorkel Terminations

6. At top of vent pipe length install another PVC 90° elbow so that elbow leg is opposite the building's exterior surface.
7. Install Rodent Screen and Vent Terminal (supplied with boiler), see Figure 8 for appropriate configuration.
8. Brace exterior piping if required.

Combustion Air Piping - Snorkel

1. See Paragraph D for instructions on attaching the vent system connector to the boiler.
2. Do not exceed maximum combustion air length. Refer to Table 7 for pipe diameters and allowable lengths.
3. Horizontal combustion air pipe must maintain a minimum ¼ inch per foot slope down towards terminal, when possible. If not, slope toward boiler.
4. After penetrating wall, install a Schedule 40 PVC 90° elbow so that elbow leg is in the up direction.

5. Install maximum vertical run of seven (7) feet of Schedule 40 PVC vent pipe. See Figure 11.
6. At top of vent pipe length install another PVC 90° elbow so that elbow leg is opposite the building's exterior surface.
7. Install Rodent Screen and Combustion Air Terminal (supplied with boiler), see Figure 8 for appropriate configuration.
8. Brace exterior piping if required.

H. The following information is applicable for Combination Concentric Gas Vent/Combustion air System (optional).

I. Field Installation of Boiler Concentric Vent Collar

The Boiler Concentric Vent Collar is shipped inside the boiler in plastic bag. The Collar mounting hardware - six (6) #8 x ½" black oxide round head Phillips sheet metal screws - are shipped inside Miscellaneous Part Carton.

1. Release four side draw latches and remove boiler lower front door assembly to gain access to the Vent Collar.

2. Remove the collar from the bag and set aside.
3. Locate and remove six mounting screws.
4. Position the Collar onto jacket combination rear/bottom panel and insert collar inner stainless steel vent pipe into the heat exchanger vent outlet.
5. Align collar plate clearance holes with rear/bottom panel engagement holes; then secure the collar to rear/bottom panel with six mounting screws. See Figure 12.
6. Flue temperature sensor, factory attached to the boiler wiring harness, is secured to the boiler rear/bottom panel with tape.
7. Remove the tape and push the sensor rubber plug into Concentric Vent Collar sensor port until the plug is securely engaged. See Figure 12.

The installation of the Concentric Vent Collar is now completed.

J. General Guidelines - Concentric Venting

1. Vent system installation must be in accordance with *National Fuel Gas Code*, NFPA 54/ANSI Z221.3 or applicable provisions of local building

Table 8: Concentric Vent Components

Part Number	Component Description	Size	Component Equivalent Vent Length, Ft	Comments
101493-01	90° Elbow – Long Radius	80/125 mm	5.5	
101491-01	45° Elbow - Long Radius	80/125 mm	3.0	
101163-01	Cut -To-Length Extension, 500 mm (19-1/2")	80/125 mm	1.63	**Can be cut
101162-01	Cut -To-Length Extension, 1000 mm (39")	80/125 mm	3.25	**Can be cut
101485-01	Fixed Extension, 2000 mm (78")	80/125 mm	3.25	***Must not be cut
101808-01	Horizontal (Wall) Terminal	80/125 mm	*NA	Supplied with boiler
101495-01	Vertical Roof Terminal	80/125 mm	*NA	See Note 1
101496-01	Flat Roof Flashing	80/125 mm		
101497-01	Sloped Roof Flashing	80/125 mm		See Note 2
101492-01	Support Elbow with Chimney Chase Bracket	80/125 mm	8.5	See Note 3
101498-01	Hanger Wall Bracket	80/125 mm		
101548-01	90° Elbow – Long Radius	100/150 mm	8.0	
101549-01	45° Elbow - Long Radius	100/150 mm	3.0	
101550-01	1 Cut -To-Length Extension, 500 mm (19-1/2")	100/150 mm	1.63	** Can be cut
101551-01	Cut -To-Length Extension, 1000 mm (39")	100/150 mm	3.25	** Can be cut
101553-01	Fixed Extension, 2000 mm (78")	100/150 mm	6.5	*** Must not be cut
101809-01	Horizontal (Wall) Terminal	100/150 mm	* NA	Supplied with boiler
101557-01	Vertical (Roof) Terminal	100/150 mm	* NA	See Note 1
101558-01	Flat Roof Flashing	100/150 mm		
101559-01	Sloped Roof Flashing	100/150 mm		See Note 2
101560-01	Support Elbow with Chimney Chase Bracket	100/150 mm	10.0	See Note 3
101561-01	Hanger Wall Bracket	100/150 mm		

Notes:

- * NA – do not include vent terminal into total vent length calculations.
 - ** These sections have plain male end and beaded female end. See Figure 11 for details.
 - *** These sections have beaded male end and beaded female end. See Figure 12 for details.
1. Vertical terminal can be used with either of the roof flashings listed beneath it.
 2. Sloped roof flashing suitable for roof angles between 25° and 45°.
 3. Used at base of vertical run inside unused masonry chimney.

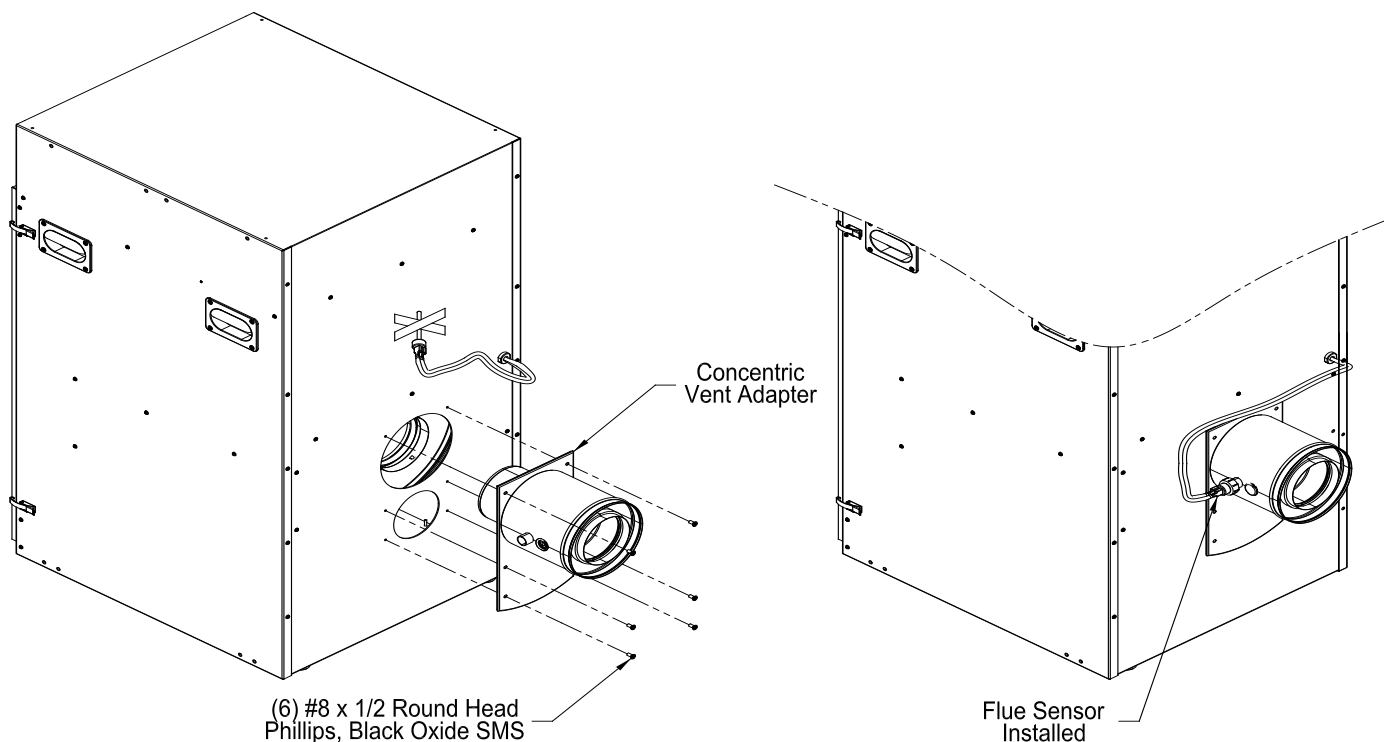


Figure 12: Field Installation of Boiler Concentric Vent Collar

codes. Contact local building or fire officials about restrictions and installation inspection in your area.

2. Horizontal vent pipe must maintain a minimum $\frac{1}{4}$ inch per foot slope towards the boiler.
3. Use noncombustible $\frac{3}{4}$ inch pipe strap to support horizontal runs and maintain vent location and slope while preventing sags in pipe. Do not restrict thermal expansion or movement of vent system. Maximum support spacing is five (5) feet. Do not penetrate any part of the vent system with fasteners.
4. Vent length restrictions are based on equivalent length of vent pipe i.e. total length of straight pipe plus equivalent length of fittings. See Table 11 for specified vent length details. Do not exceed maximum vent length. Table 8 lists available concentric vent components and includes equivalent vent length for fittings. Do not include vent terminal into total vent length calculations.

5. Provide and maintain vent pipe minimum clearances to combustible material. See Figure 2 and Table 10 for details.
6. Provide minimum service clearance between boiler back and concentric vent exiting through outside wall, for concentric vent installation/replacement and/or flue temperature sensor service/replacement, as follows:
 - a. For horizontal venting where supplied Concentric Vent Terminal is attached directly to installed Boiler Concentric Vent Collar - 6 inches
 - b. For vertical venting where optional Concentric Vent 90° long radius elbow is attached to installed Boiler Concentric Vent Collar - 18 inches
7. Do not install venting system components on the exterior wall of the building except as specifically required by these instructions. Refer to Figure 7.

Table 9: Vent System Components Included with Boiler

Vent System Components	Part Number
80/125mm Horizontal (Wall) Terminal (ALP080 thru ALP210)	101808-01
100/150mm Horizontal (Wall) Terminal (ALP285 thru ALP399)	101809-01

Table 10: Clearances from Vent Piping to Combustible Material

Vent Pipe	Pipe Direction	Enclosure	Minimum Clearance To Combustible Material, Inches
CPVC/PVC Venting	Vertical Or Horizontal	Enclosed at All Sides	1" Vent/0" Combustion Air

Table 11: Concentric Vent Length

Boiler Model	Concentric Vent	Inner/Outer Pipe Dia., mm	Vent Length		Wall Opening Diameter
			Minimum	* Maximum	
ALP080	Factory Supplied Horizontal (Wall) Terminal	80/125 mm	21-7/8 in	Total of 60 Equivalent ft.	5-1/2 in
ALP105					
ALP150					
ALP210					
ALP285	Factory Supplied Horizontal (Wall) Terminal	100/150 mm	32 in		6-1/2 in
ALP399					

Note: * With optional concentric vent components. See Table 10 for details.

The direct vent termination location is restricted as follows:

- a. Minimum twelve (12) inches above grade plus normally expected snow accumulation level, or minimum seven (7) feet above grade, if direct vent terminal is located adjacent to public walkway. Do not install the terminal over public walkway where local experience indicates that appliance flue gas vapor or condensate creates a nuisance or hazard.
 - b. Minimum three (3) feet above any forced air inlet located within ten (10) feet.
 - c. Minimum four (4) feet horizontally from electric meters, gas meters, regulators and relief valves. This distance may be reduced if equipment is protected from damage due to flue gas vapor or condensation by enclosure, overhang, etc.
 - d. Minimum twelve (12) inches below, above or horizontally from any air opening into a building (window, door or gravity air inlet).
 - e. Minimum twelve (36) inches horizontally from a building corner.
 - f. Minimum twelve (12) inches vertically from any roof overhang twelve (12) inches or less wide. If a roof overhang width exceeds twelve (12) inches the terminal vertical clearance must be increased to avoid flue vapor condensation.
8. Enclose vent passing through occupied or unoccupied spaces above the boiler with material having a fire resistance rating of at least equal to the rating of the adjoining floor or ceiling. Maintain minimum clearances to combustible materials. See Figure 2.
- Note: For one or two family dwellings, fire resistance rating requirement may not need to be met, but is recommended.
9. Plan venting system to avoid possible contact with plumbing or electrical wires. Start at vent connector on top of boiler and work towards vent terminal.

Concentric Venting - Horizontal Venting

1. Permitted terminals for horizontal venting:
Horizontal (Wall) Terminal, either 80/125 mm (P/N 101808-01) or 100/150 mm (P/N 101809-01) - see Table 8.

2. Concentric Vent components supplied with the boiler are packed inside boiler carton and include the following:

- a. 80/125 mm Horizontal (Wall) Terminal, Part Number 101808-01
 - Horizontal (Wall) Terminal consists of Straight section having plain male end with locking band clamp installed; Terminal Assembly with offset vent termination, and Outside Wall Plate, both riveted on the opposite end; overall length is approximately 28-1/8".
 - Separate Inside Wall Plate
 - Two Hardware Bags (each bag contains four screws and four anchors) to attach vent terminal Outside Wall Plate to exterior wall and Inside Wall Plate to interior wall.
- b. 100/150 mm Horizontal (Wall) Terminal, Part Number 101809-01
 - Horizontal Concentric Vent Terminal, which consists of Straight section having plain male end with locking band clamp installed; Terminal Assembly with offset vent termination, and Outside Wall Plate, both riveted on the opposite end; overall length is approximately 31-1/8".
 - Separate Inside Wall Plate.
 - Two Hardware Bags (each bag contains four screws and four anchors) to attach vent terminal Outside Wall Plate to exterior wall and Inside Wall Plate to interior wall.

14. Installation of the Boiler Concentric Vent Collar is covered in Section I above. See Figure 12.
15. For horizontal (side wall) installation, the Horizontal (Wall) Terminal will extend past outer wall surface either by 4-1/4" (80/125 mm), or, 5-1/2" (100/150 mm). See Figure 13 "Horizontal (Wall) Terminal Installation".
17. For horizontal venting, to install the Horizontal (Wall) Terminal:
 - a. Cut a 5-1/2" diameter hole through the exterior wall opening (for 80/125 mm concentric vent) or 6-1/2" diameter hole (for 100/150 mm concentric vent) at the planned location of the horizontal terminal.

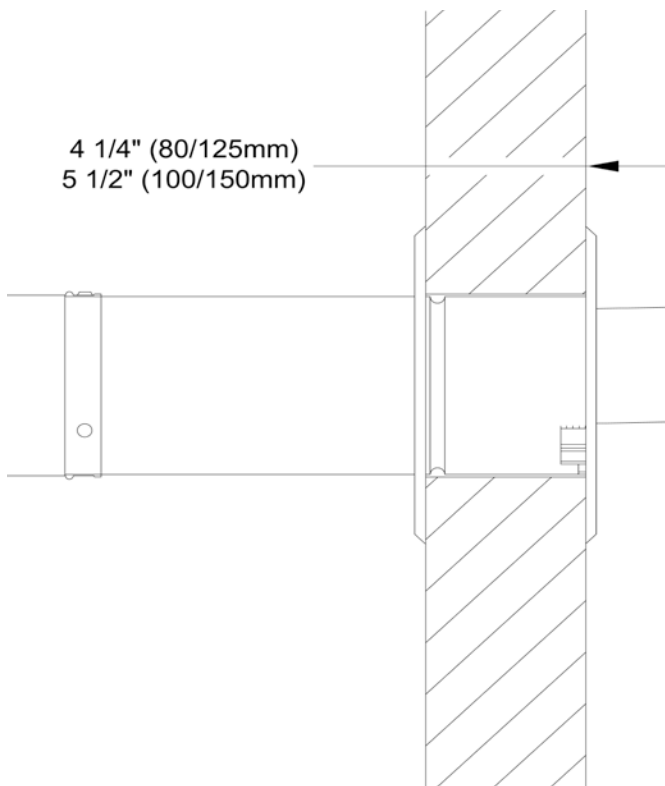


Figure 13: Horizontal (Wall) Terminal Installation

- b. Measure dimension “L” from exterior wall outer surface to the end of the last fitting (or end of installed Boiler Concentric Vent Collar). See Figure 14 ‘Dimension “L”’.

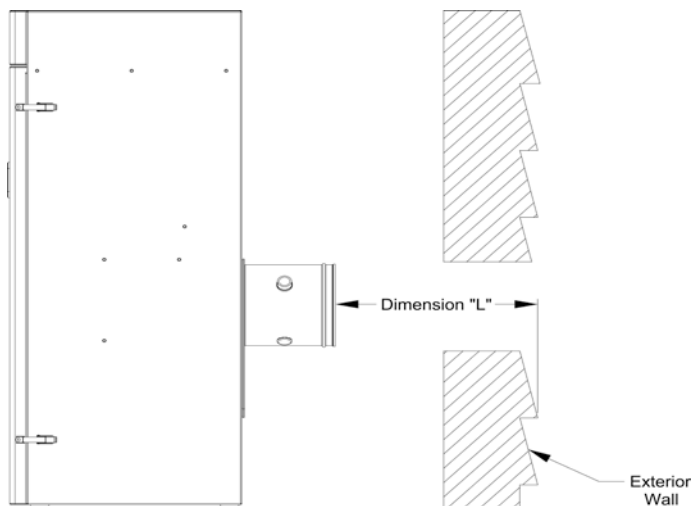


Figure 14: Dimension “L”

- c. When factory supplied Horizontal (Wall) Terminal needs to be shortened, measure dimension “L” plus 1-1/4” from inside of the attached Outside Wall Plate and mark the Horizontal (Wall) Terminal outer pipe. To achieve a square cut of the outer pipe, place

several marks around the outer pipe to establish a cut line. See Figure 15 ‘Cutting Outer Pipe’.

- d. Carefully cut the outer pipe at the marked line using aviation shears, a hacksaw etc. Ensure the pipe is cut square and cut end is deburred.

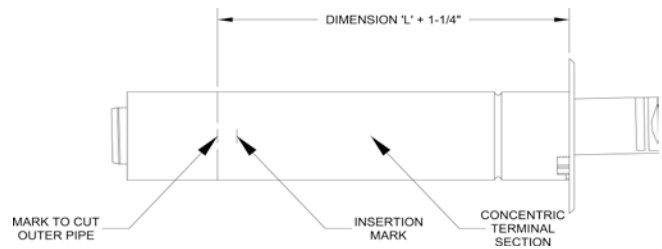


Figure 15: Cutting Outer Pipe

- e. Mark the end of the Horizontal (Wall) Terminal inner polypropylene vent pipe to extend 3/4” past the cut end of the outer pipe. To achieve a square cut of the inner pipe, place several marks around the inner pipe to establish a cut line.
- f. Cut off the marked end of inner polypropylene vent pipe with a fine tooth blade hacksaw etc. and deburr. See Figure 16 “Cutting Inner Pipe.”
- g. Place a mark around the outer pipe, 1” from cut edge, towards the attached Outside Wall Plate, to establish visual insertion line as shown in Figure 16 “Cutting Inner Pipe”.
- h. Pass the shortened Horizontal Concentric Vent from outside, thru earlier cut exterior wall opening and push in until the attached Outside Wall Plate is tight against exterior wall surface. Insure the proper position of the Horizontal Concentric Vent before securing the Outside Wall Plate to the wall with provided fasteners. Seal plate edges with exterior grade sealant to prevent moisture penetration.

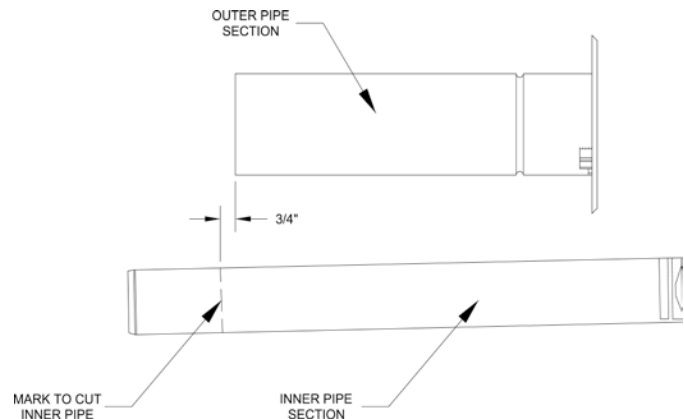


Figure 16: Cutting Inner Pipe

WARNING

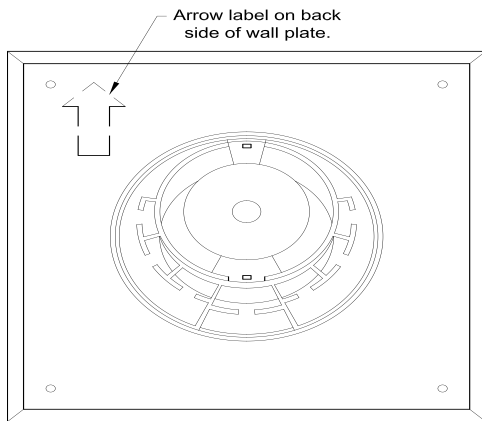
The terminal vent portion is offset towards the top inside the outer pipe of the Horizontal Concentric Vent Terminal to provide vent pipe pitch towards the boiler for condensate removal.

See Figure 17 'Horizontal (Wall) Terminal Detail'. It is imperative to properly mount the vent terminal.

The terminal orientation label is located on the inside of the terminal Outside Wall Plate. Insure the vent terminal is positioned as shown in Figure 18 before securing the Outside Wall Plate to exterior wall.

CAUTION

Exterior wall surface must be reasonably flat to attach the Outside Wall Plate. When exterior wall surface is not flat (covered with vinyl or wood shingle siding etc.) the siding must be removed, and a flat surface build up flush or above siding exterior surface to secure/seal the terminal Outside Wall Plate.



Vent wall plate as looking from front of part.

Figure 17: Horizontal (Wall) Terminal Detail

- i. Install the supplied Inside Wall Plate onto the shortened Horizontal (Wall) Terminal interior end and move the plate to cover interior wall cut opening. Secure the plate with provided fasteners, then, apply the sealant around plate sides to seal it to interior wall.
- j. Lubricate the brown gasket inside boiler concentric vent collar or the last section of the vent pipe with small amount of water.
- k. Ensure that inner pipe of the terminal is evenly engaged into the gasket all around, then push the termination male end inside boiler concentric vent collar or the last section of the vent pipe, until the mark (see Step g) is no longer visible.
- l. Re-install locking band clamp onto the joint to secure the terminal to the collar or the last section of the vent pipe.

Concentric Venting - Vertical Venting

For vertical (through the roof) venting, extend Vertical (Roof) Terminal to maintain minimum 12 inches vertical and horizontal distance from building roof surface. Allow additional vertical distance for expected snow accumulation. Provide brace as required. See Figure 19 'Vertical Concentric Vent Installation'.

1. For vertical venting, where optional Concentric Vent 90° degree long radius elbow is attached to installed Boiler Concentric Vent Collar, to install elbow:
 - a. Remove locking band clamp off the terminal and set aside.
 - b. Lubricate the brown gasket inside boiler concentric vent collar with small amount of water.
 - c. Ensure that male end of the elbow inner plastic pipe is evenly engaged into the gasket all around, then, push the elbow male end inside boiler concentric vent collar until the bead on male end of elbow outer pipe bottoms out inside boiler vent collar.

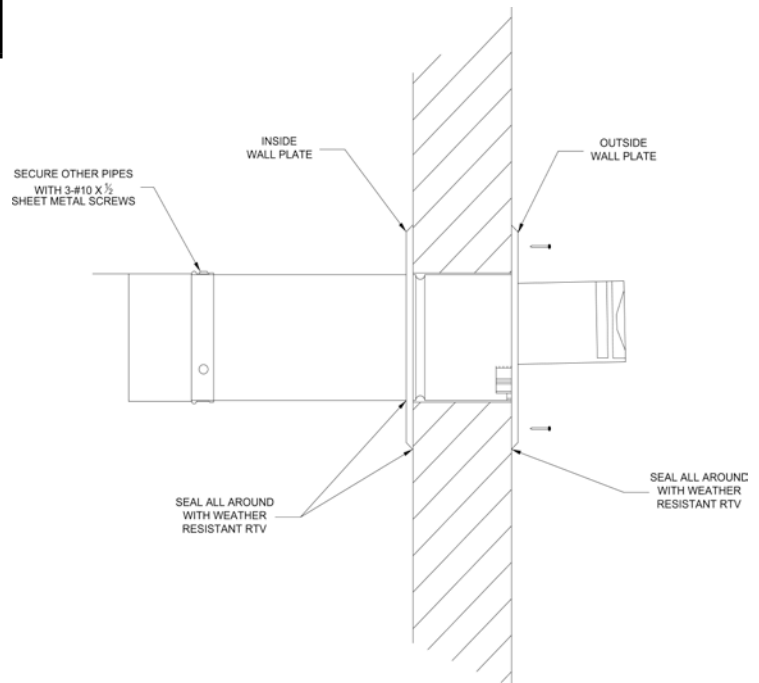


Figure 18: Completing Horizontal (Wall) Terminal Installation

- d. Re-install locking band clamp onto the joint to secure the elbow to the collar.
- e. Continue installing additional concentric vent cuttable or non-cuttable piping as required.
2. Additionally, secure elbow to boiler vent collar with three evenly spaced #8 x 1/2" sheet metal screws. Use collar rivets as reference attachment points. Mark (center punch) each screw location off each rivet centerline 5/8" towards collar-beaded end. See Figure 18 'Completing Horizontal (Wall) Terminal Installation' for details. Drill 1/8" hole thru both

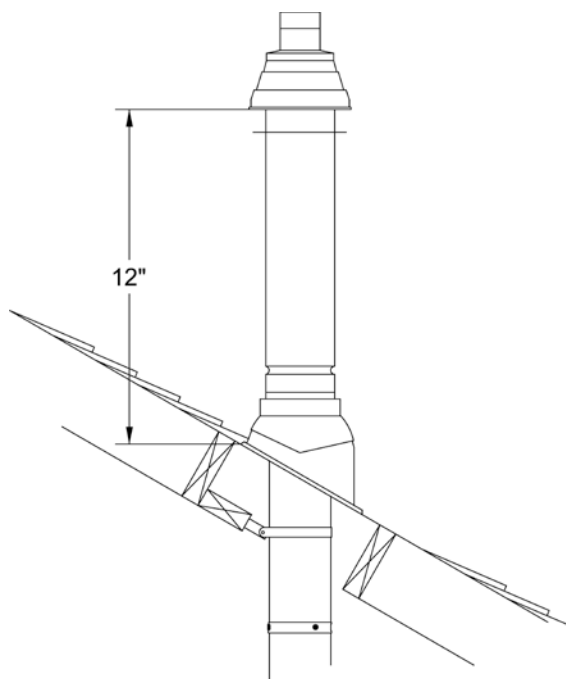


Figure 19: Vertical Concentric Vent Installation

outer pipes to start the screw. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use sheet metal screws longer than 1/2".**

When Additional Concentric Vent Piping is needed

1. If additional concentric vent piping is needed:
 - a. Concentric Vent Cut-To-Length Extension pipes, **identified in Tables 8 and 10 CAN BE CUT** to required length when used as an extension. **These pipes have plain male end and beaded female end. Always cut the pipe from plain male end.** See Figure 20 'Cut-To-Length Extension (Cuttable)'".

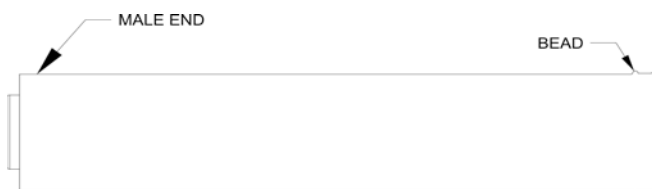


Figure 20: Cut-To-Length Extension (Cuttable)

- b. The remaining Concentric Vent Fixed Extensions shown in Table 8 **CANNOT BE CUT**. These pipes have beaded male and beaded female ends. See Figure 21 'Fixed Extension (Non-Cuttable)'.
2. To cut the Concentric Vent Straight pipe to required length refer to Figure 22 "Cutting Straight Pipe" and follow the procedure below:
 - a. Determine the required length of the outer pipe. When doing this allow an additional 1" of length for insertion into the female end of the adjoining pipe. Mark the cut line on the outer pipe.

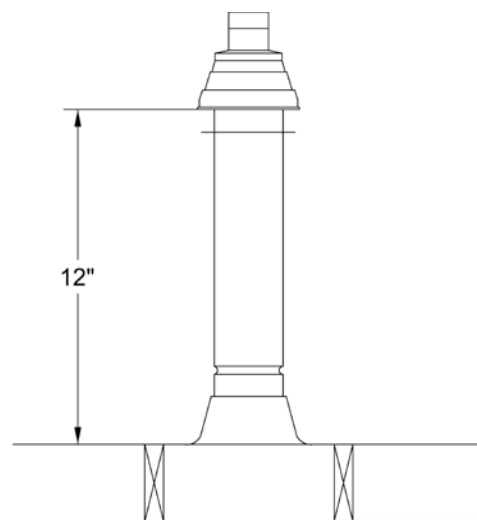


Figure 21: Fixed Extension (Non-Cuttable)

- b. Remove the plastic inner pipe by pulling it out from the female end.
- c. Cut the **OUTER PIPE ONLY** at the point marked in Step (a) using aviation shears, a hacksaw, or an abrasive wheel cutter. Be careful to cut the pipe square. Deburr the cut end with a file or emery cloth.
- d. Make an insertion mark 1" from the male end of the outer pipe.
- e. Cut the plastic inner pipe so that it will protrude 3/8" beyond the male end of the outer pipe when reinstalled in the outer pipe. Use a fine tooth hacksaw or a PVC saw to cut the plastic pipe and be careful to cut the pipe square. Deburr the cut edge of the plastic pipe with a file, razor blade or fine sandpaper.
- f. Reinstall the inner pipe.
3. To join Concentric Vent Pipe refer to Figure 23 "Joining Cuttable Pipe" and Figure 24 "Joining Non-Cuttable Pipe" and follow the procedure below:
 - a. Start assembly of the vent system at the boiler. Lubricate the brown gasket in the boiler vent collar with a few drops of water.

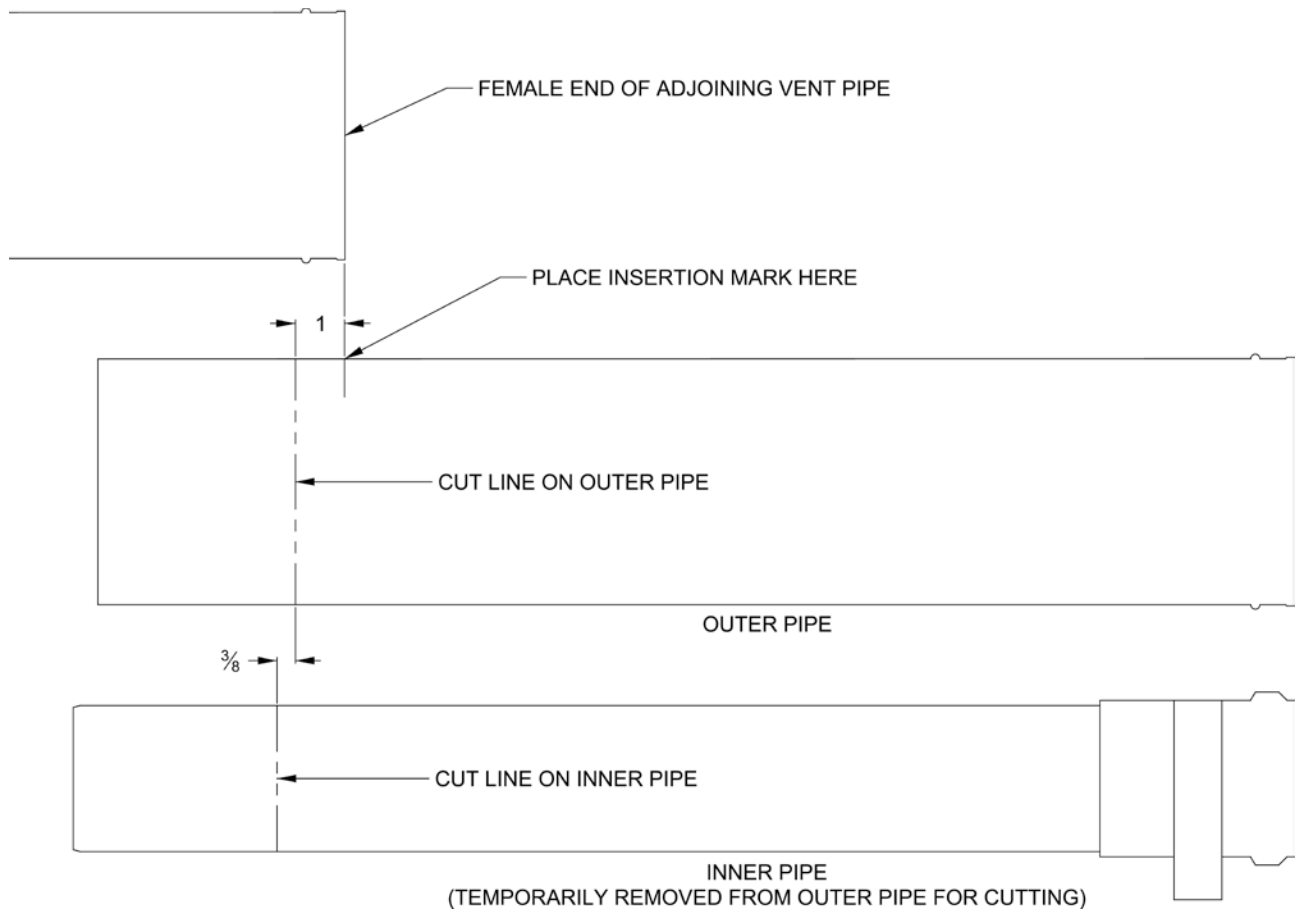


Figure 22: Cutting Straight Pipe

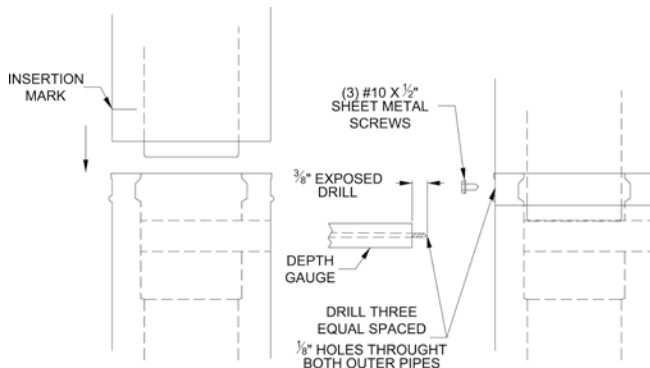


Figure 23: Joining Cuttable Pipe

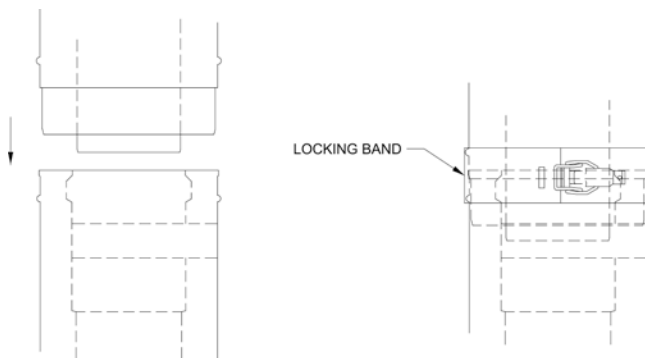


Figure 24: Joining Non-Cuttable Pipe

- b. Push the male end of the first fitting into the boiler collar until it bottoms out. The male end of cuttable sections should go 1" into the collar until the insertion mark (made in Step 2d above) is covered. On other fittings, the bead on the male pipe will be bottom out on the collar (see Figure 24).
- c. The male end of cuttable fittings must be held to the collar with three (3) #10 x 1/2" sheet metal screws. Drill a 1/8" hole through both outer pipes to start this screw. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use a sheet metal screw longer than 1/2"** (see Figure 23).
- d. Use locking bands (provided with all fittings) to secure non-cuttable pipe, as well as fittings, to the boiler collar (see Figure 24).
- e. Use the same method to join all remaining vent components except for the terminal.

Vertical (Roof Terminal Installation

1. Vertical (Roof) Terminal Installation. Refer to Figures 26, 27 and 28.

In addition to the vertical terminal, either a Flat Roof Flashing or Sloped Roof Flashing is required for this installation. Refer to Table 8 'Concentric Vent Components' for details.

- a. Determine the centerline of the terminal location on the roof. For flat roof, cut either 5-1/2" diameter hole (80/125 mm concentric vent size) or 6-1/2" diameter hole (100/150 mm concentric vent size) for the terminal. For sloped roof, cut a hole in the roof large enough for the terminal to pass through the roof while remaining plumb.

CAUTION

If the boiler is located directly under the hole, cover it while cutting the hole to prevent debris from falling onto boiler.

- b. Install the roof flashing using standard practice on the roofing system of the structure.
- c. If not already done, assemble the venting system inside the building. The last section of pipe needs to be on the same center line as the terminal and within 19-1/4" of the top edge of the roof flashing.
- d. Measure distance "H" from the top edge of the storm collar to the end of the last fitting as shown in Figure 25.
- e. Add 1" to distance "H". Carefully mark this length on the pipe as shown in Figure 26.
- f. Cut the **outer pipe only** at the point marked in Step (e) using aviation shears, a hacksaw, or an

abrasive wheel cutter. Be careful to cut the pipe square. De-burr the cut end with a file or emery cloth.

- g. Place a mark on the plastic inner pipe 3/8" beyond the end of the outer pipe (Figure 26). Use a fine tooth hacksaw to cut the plastic pipe and be careful to cut the pipe square. De-burr the cut edge of the plastic pipe with a file or emery cloth.
- h. Make a mark on the terminal section 1" from the cut end of the outer pipe as shown in Figure 26.
- i. Slip the terminal section through the roof from the outside. Push into the last section of vent pipe until the mark made in Step (h) is not longer visible. Secure the terminal to the last piece of pipe with three #10 x 1/2" sheet metal screws. Drill a 1/8" hole through both outer pipes to start these screws. **Use a drill stop or other means to ensure that the drill bit does not penetrate more than 3/8" into the outer pipe. Do not use a sheet metal screw longer than 1/2".**
- j. Secure the terminal section to the inside of the roof structure using the mounting bracket provided with the terminal (Figure 27).

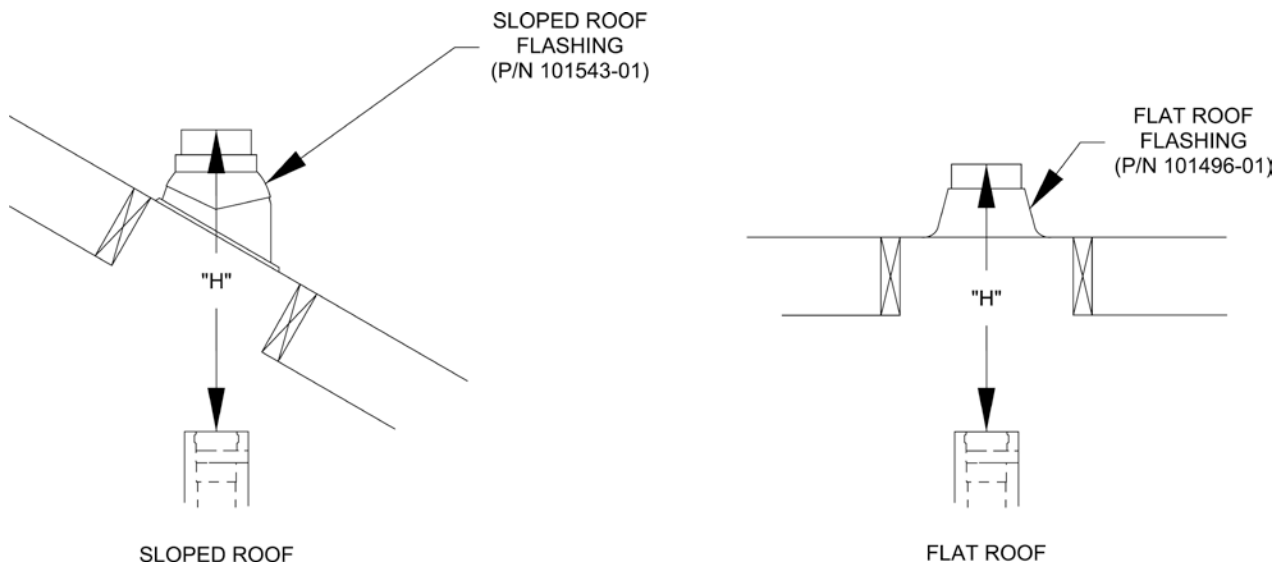


Figure 25: Dimension "H"

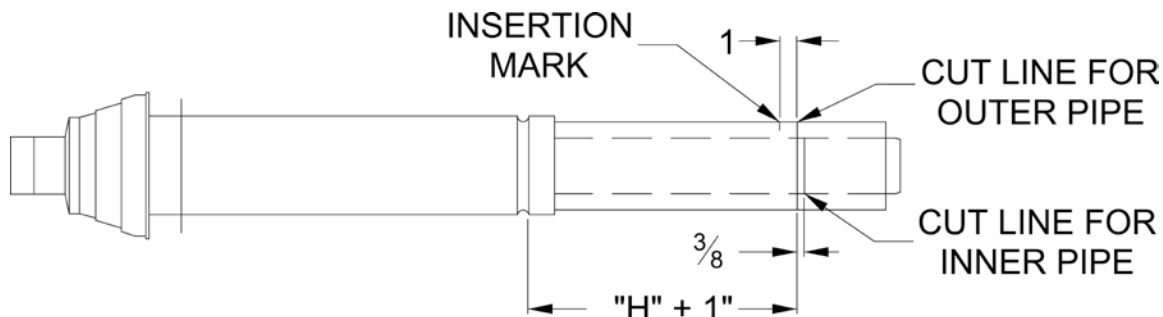


Figure 26: Cutting Vertical Terminal

Table 10: Cut-To-Length Extensions (Cuttable)

Part No.	Component Description	Size
101163-01	Cut-To-Length Extension, 500 mm (19-1/2")	80/125 mm
101162-01	Cut-To-Length Extension, 1000 mm (39")	
101550-01	Cut-To-Length Extension, 500 mm (19-1/2")	100/150 mm
101551-01	Cut-To-Length Extension, 1000 mm (39")	

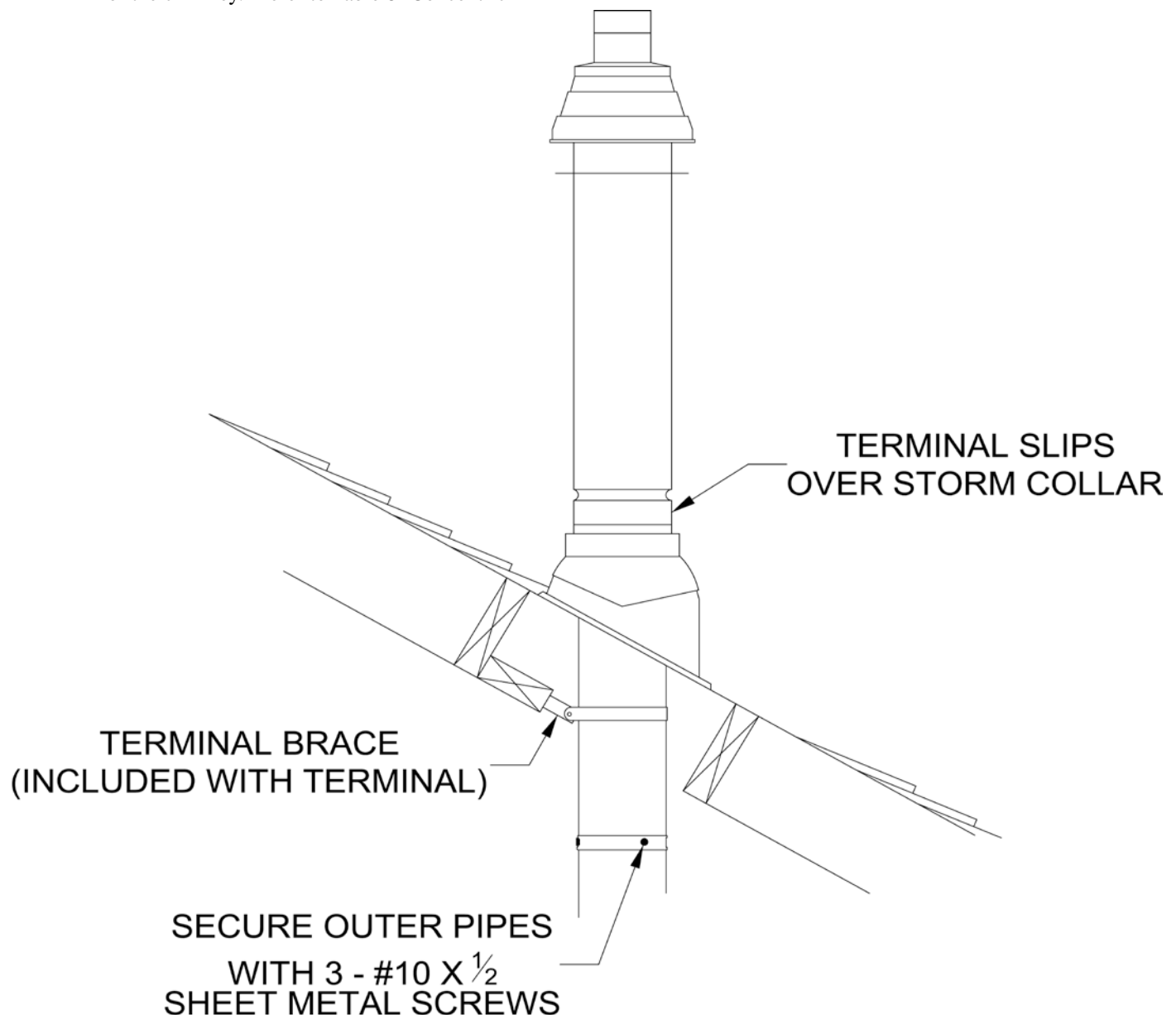
Chimney Chase Installation.

A vertical concentric vent system, either 80/125 mm or 100/150 mm can be installed in an UNUSED masonry chimney. Refer to Figure 28.

- a. The Chimney chase Support Elbow with attached Mounting Bracket is used at the base of the chimney. Refer to Table 8 'Concentric

Vent Components' for details. Slip the elbow over the M10 x 35 screw in the support bracket. Determine the desired vertical location of the support elbow in the chimney and mark the location of the pin, positioned on the back of the support bracket, onto the chimney rear wall. Drill a 7/16" diameter x 3-1/2" deep hole in the marked location, then, insert the back bracket pin into the hole. The front of the elbow mounting bracket should be supported either by bottom of the opening into chimney or installer supplied spacer.

- b. Construct a weather-tight flat roof to cover the top of the old chimney. Install the vertical terminal through this roof using the flat roof flashing.

**Figure 27: Completing Vertical Terminal Installation**

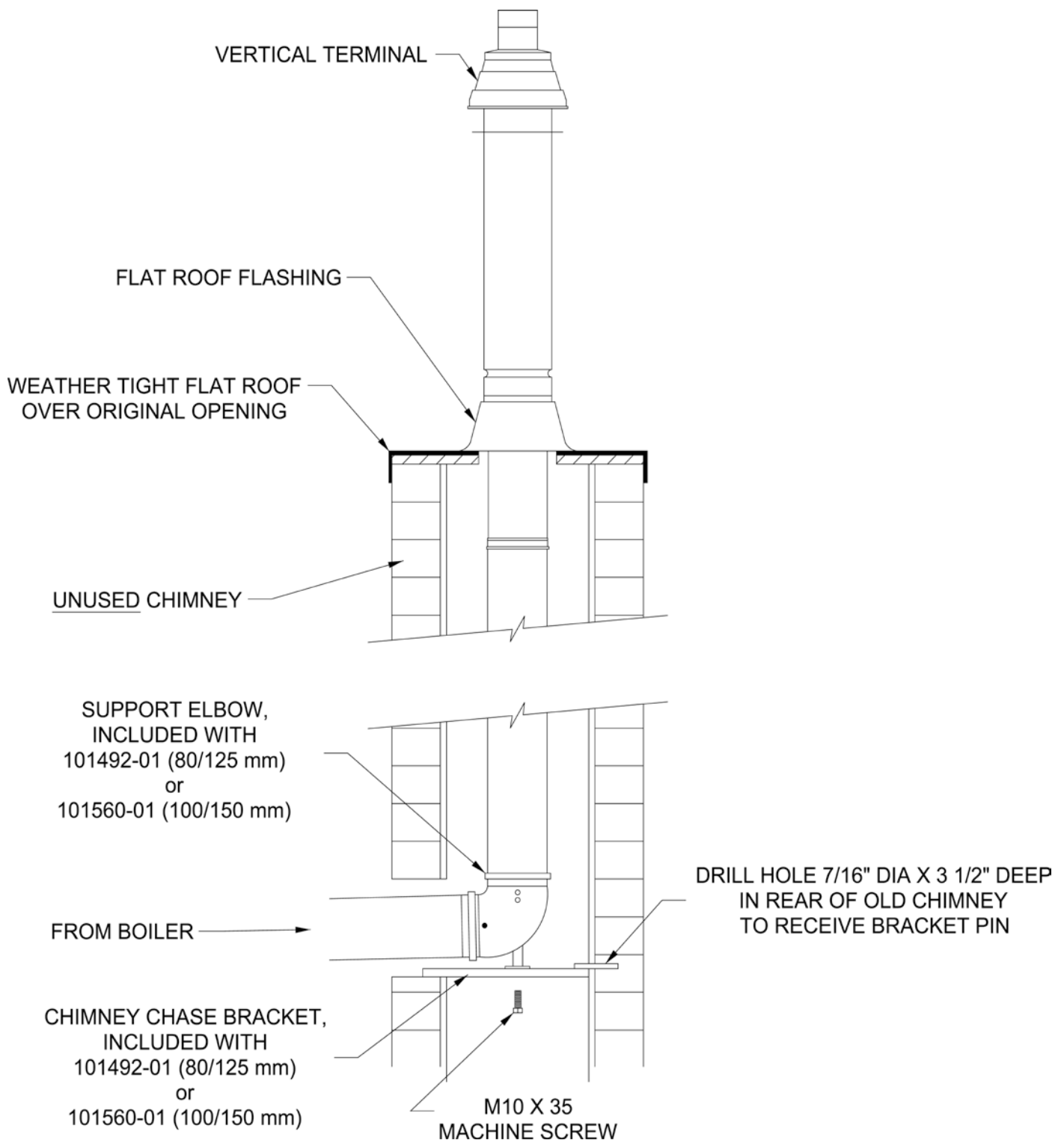


Figure 28: Chimney Chase Installation

V. Condensate Disposal

A. Condensate Trap and Drain Line.

1. All condensate, which forms in the boiler or vent system, collects in the sump under heat exchanger and leaves the boiler through factory installed condensate trap.
2. The trap allows condensate to drain from sump while retaining flue gases in the boiler. The trap has factory installed overflow switch, which shuts down the boiler in the event the drain line becomes obstructed, preventing proper condensate removal. Refer to Section XIII "Service and Maintenance" for condensate trap and condensate overflow switch removal and replacement procedure, if required.
3. Note the following when disposing of the condensate:
 - a. Condensate is slightly acidic, typical pH around 3.5 - 4.5. Do not use metallic pipe or fittings in the condensate drain line. Do not route the drain line through areas that could be damaged by leaking condensate.
 - b. Do not route or terminate the condensate drain line in arrears subject to freezing temperatures.
 - c. If the point of condensate disposal is above the trap, a condensate pump is required to move the condensate to the drain. Select a condensate pump approved for use with condensing furnaces. If overflow from the pump would result in property damage, select a pump with an overflow switch. Wire this switch in series with installer provided external high limit, to shut off the boiler, and, if desired, in series with installer-supplied alarm, to trigger an alarm in the event of overflow.
 - d. Do not attempt to substitute another trap for one provided with the boiler.
 - e. In order for boiler to work properly, the boiler must be leveled during installation.
4. The condensate trap stub is located at boiler left side, below inlet and outlet water pipe connections. Refer to Figures 1A and 1B.
5. Condensate trap must be filled up with water, prior to boiler start-up and before connecting any condensate line to the boiler, to insure combustion products cannot escape from operating boiler. To fill the trap, inject water in the amount of 1 cup (8 fluid ounces) through condensate trap stub opening. Do not overfill the trap.

6. If any additional condensate drain line is needed, construct the extension from PVC or CPVC Schedule 40 pipe. The factory supplied $\frac{3}{4}$ " x 5-5/8" long PVC coupling, located in the Part Carton, must be used to connect drain line to the condensate trap stub. Do not over tighten coupling compression nuts when connecting drain line and condensate trap stub.

WARNING

Failure to install the condensate trap and condensate drain in accordance with the above instructions could cause flue gas to enter the building, resulting in personal injury or death.

CAUTION

Boiler condensate is corrosive. Route condensate drain line in a manner such that any condensate leakage will not cause property damage.

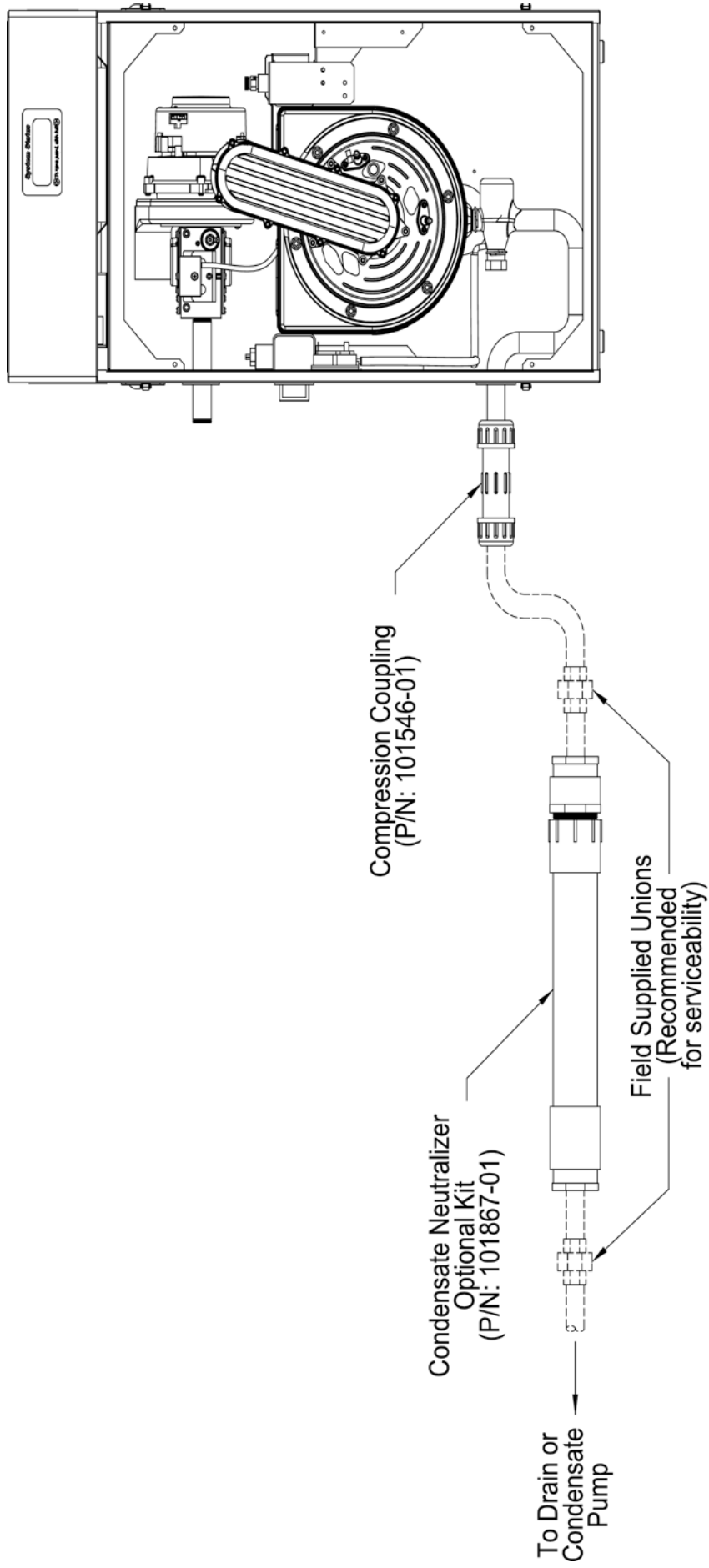
Some jurisdictions may require that condensate be neutralized prior to disposal.

NOTICE

Use materials approved by the authority having jurisdiction.

B. Condensate Neutralizer Installation

1. Some jurisdictions may require that the condensate be neutralized before being disposed of. Follow local codes pertaining to condensate disposal.
2. A Condensate Neutralizer Kit (P/N 101867-01) is available as optional equipment. Follow local codes and instructions enclosed with the kit for Condensate Neutralizer installation.
3. Limestone chips will get coated by neutral salts (product of chemical reaction between limestone and acidic condensate) and lose neutralizing effectiveness over time. Therefore, periodic condensate neutralizer maintenance and limestone chip replacement must be performed. A pH test or acid test kits are available from HVAC/plumbing distributors and should be used to measure condensate acidity before/after neutralizer thus indicating a need for service and chip replacement.



Dashed line parts are field supplied.

Figure 29: Condensate Trap and Drain Line

VI. Water Piping and Trim

WARNING

Failure to properly pipe boiler may result in improper operation and damage to boiler or structure.

Install boiler so that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, etc.).

NOTICE

Oxygen contamination of boiler water will cause corrosion of iron and steel boiler components, and can lead to boiler failure. Burnham's Standard Warranty does not cover problems caused by oxygen contamination of boiler water or scale (lime) build-up caused by frequent addition of water.

Do not fill boiler with softened water to prevent chloride contamination.

A. Installation of Factory Supplied Piping and Trim Components

Alpine (ALP) boilers have factory supplied Miscellaneous Part Carton (P/N 101777-01 – ALP080 thru ALP210; 101777-02 – ALP285; 101777-03 – ALP399), which includes supply piping components, gas piping components, Temperature & Pressure Gauge, Pressure Relief Valve and Drain Valve. See Figure 30 “Factory Supplied Piping and Trim Installation”. Install these components prior to connecting boiler to system piping as follows:

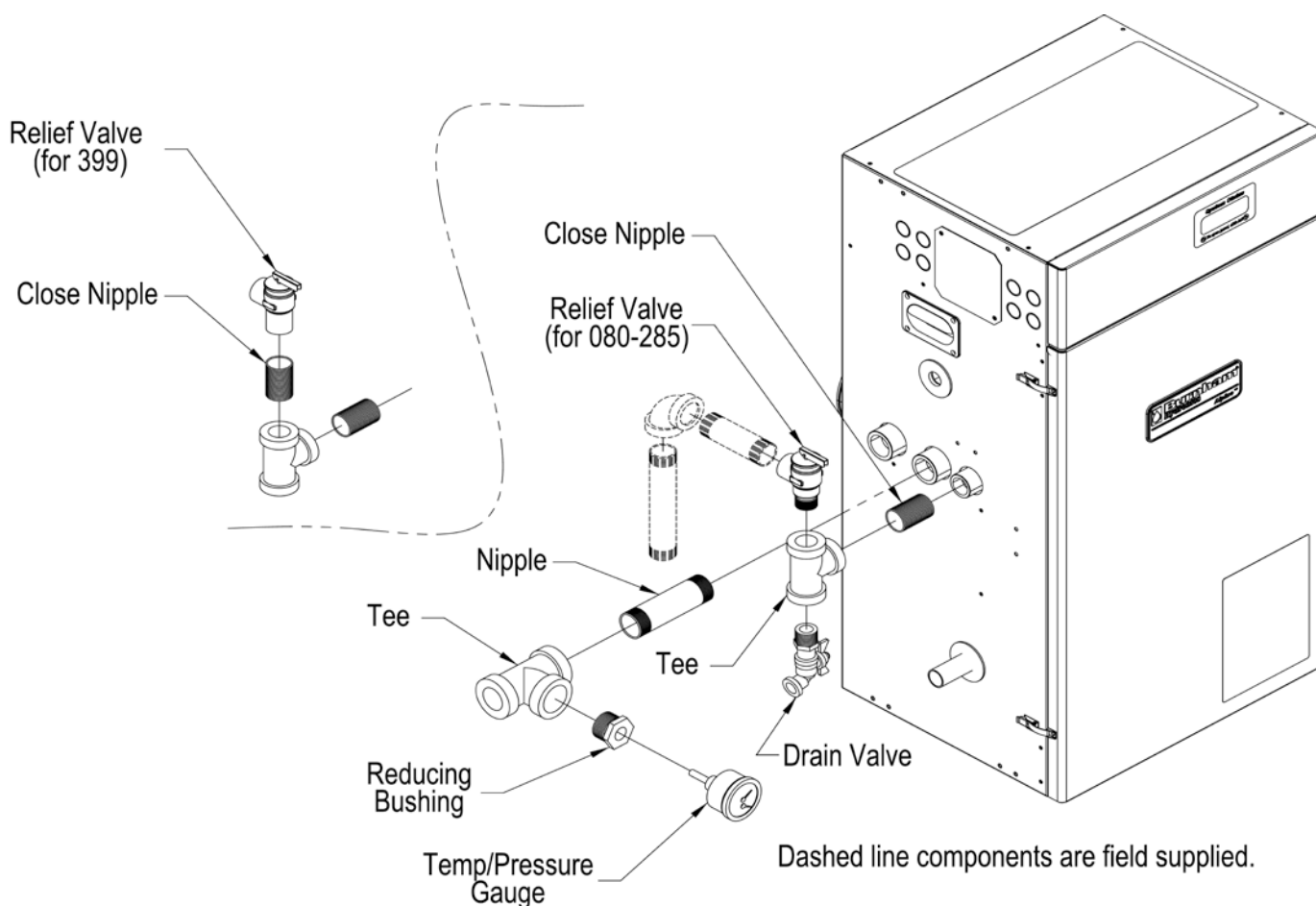


Figure 30: Factory Supplied Piping and Trim Installation

1. ALP080 thru ALP285 Boiler Models
 - a. Locate and remove 3/4" NPT x close black nipple, 3/4" NPT black tee, 3/4" MPT x 3/4" FPT Pressure Relief Valve, 3/4" NPT Drain Valve.
 - b. Install close nipple into tee branch, then, screw the assembly into boiler left side front 3/4" tapping making sure tee run outlets are in vertical plane and parallel to boiler side.
 - c. Mount 3/4" MPT x 3/4" FPT Pressure Relief Valve into the tee top outlet.
 - d. Install Drain Valve into the tee bottom outlet.
2. ALP399 Boiler Model
 - a. Locate and remove (2) 3/4" NPT x close black nipples, 3/4" NPT black tee, 3/4" FPT x 3/4" FPT Pressure Relief Valve, 3/4" NPT Drain Valve.
 - b. Install close nipple into tee branch, then, screw the assembly into boiler left side front 3/4" tapping making sure tee run outlets are in vertical plane and parallel to boiler side.
 - c. Install the second close nipple into tee run top outlet.
 - d. Mount 3/4" FPT x 3/4" FPT Pressure Relief Valve into the tee top outlet.
 - e. Install Drain Valve into the tee bottom outlet.
3. ALP080 thru ALP210 Boiler Models
 - a. Locate and remove 1" NPT x 4" long black nipple, 1" x 1" x 1" NPT black tee, 1" x 1/4" NPT black reducing bushing and Temperature & Pressure Gauge.
 - b. Mount the nipple into 1" boiler supply tapping (see Figure 1A), then, install the tee onto the nipple, making sure 1" branch outlet is in horizontal plane and facing the boiler front.
 - c. Install 1" x 1/4" NPT black reducing bushing into the tee branch, then, put in Temperature & Pressure Gauge.
4. ALP285 Boiler Model
 - a. Locate and remove 1 1/4" NPT x 2" long black nipple, 1 1/4" x 1 1/4" x 3/4" NPT black tee, 3/4" x 1/4" NPT black reducing bushing and Temperature & Pressure Gauge.
 - b. Mount the nipple into 1 1/4" boiler supply tapping (see Figure 1B), then, install the tee onto the nipple, making sure 3/4" branch outlet is in horizontal plane and facing the boiler front.
 - c. Install 3/4" x 1/4" NPT black reducing bushing into the tee branch, then, put in Temperature & Pressure Gauge.
5. ALP399 Boiler Model
 - a. Locate and remove 1 1/2" NPT x 2" long black nipple, 1 1/2" x 1 1/2" x 3/4" NPT black tee, 3/4" x 1/4" NPT black reducing bushing and Temperature & Pressure Gauge.
 - b. Mount the nipple into 1 1/2" boiler supply tapping (see Figure 1B), then, install the tee onto the nipple, making sure 3/4" branch outlet is in horizontal plane and facing the boiler front.
 - c. Install 3/4" x 1/4" NPT black reducing bushing into the tee branch, then, put in Temperature & Pressure Gauge.

B. Piping System To Be Employed.

Alpine (ALP) boilers are designed to operate in a closed loop pressurized system. Minimum pressure in the boiler must be 12 PSI. Proper operation of the Alpine (ALP) boiler requires that the water flow through the boiler remain within the limits shown in Table 11, any time the boiler is firing.

NOTICE

Failure to maintain the flow through boiler within specified limits could result in erratic operation or premature boiler failure.

1. Near boiler piping must isolate ALP boiler from system piping via closely spaced tees to insure specified flow range through boiler any time the boiler is firing:

Table 11: Flow Range Requirement Through Boiler

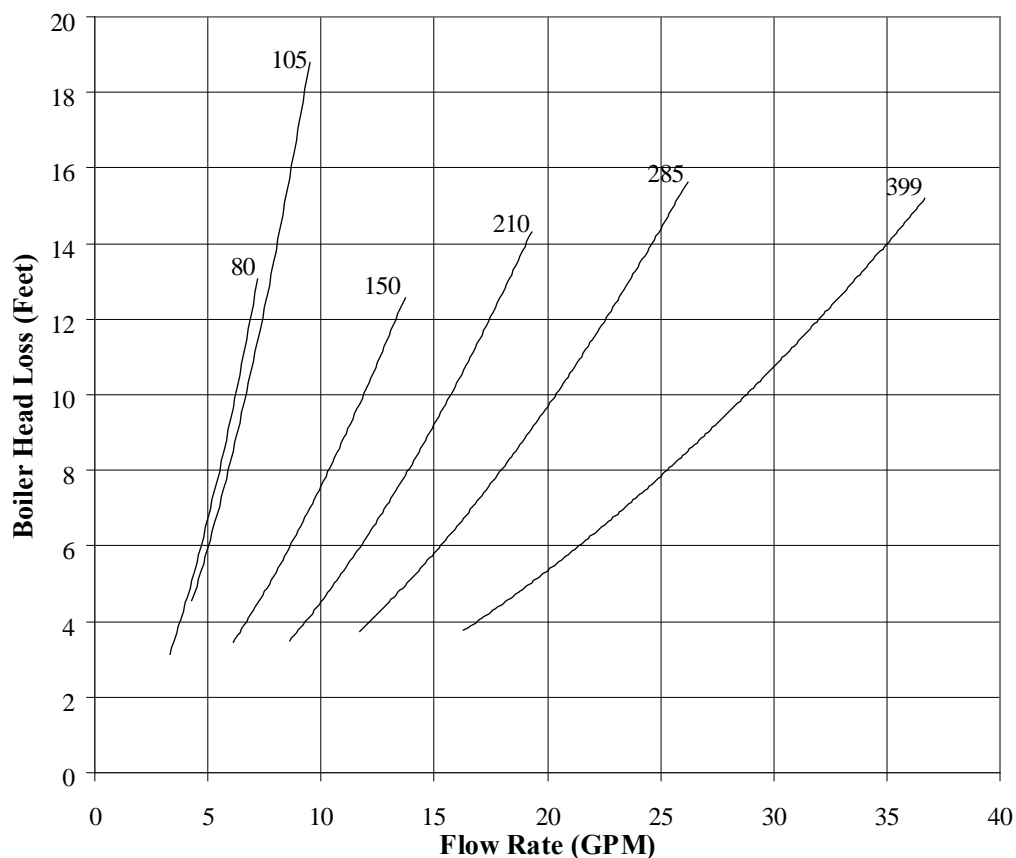
Boiler Model	Boiler Supply Connection, Inch, FPT	Boiler Return Connection, Inch, FPT	Minimum Required Flow (GPM) @ 35°F ΔT	Boiler Head Loss, Ft. @ 35°F ΔT	Required Flow, (GPM) @ 30°F ΔT	Boiler Head Loss, Ft. @ 30°F ΔT	Required Flow, (GPM) @ 25°F ΔT	Boiler Head Loss, Ft. @ 25°F ΔT	Maximum Required Flow (GPM) @ 20°F ΔT	Boiler Head Loss, Ft. @ 20°F ΔT
ALP080	1	1	4.2	4.8	4.9	6.4	5.8	8.9	7.3	13.4
ALP105	1	1	5.5	7.0	6.4	9.3	7.7	12.8	9.6	19.1
ALP150	1	1	7.9	5.2	9.2	6.6	11.0	8.9	13.8	12.7
ALP210	1	1	11.1	5.4	12.9	7.1	15.5	9.8	19.4	14.4
ALP285	1¼	1¼	15.1	5.9	17.7	7.8	21.2	10.7	26.5	16.0
ALP399	1½	1½	21.5	6.1	25.1	7.9	30.2	10.8	37.7	15.9

Notes: Required Flow (GPM) = ** Output (MBH) * 1000/500 * ΔT

** Output (MBH) - Select Value for specific Boiler Model from Tables 2A or 2B

Using boiler antifreeze will result in higher fluid density and may require larger circulators.

Alpine Boiler Head Loss vs. Flow



- a. The flow rate through the isolated near-boiler loop is maintained by factory recommended and installer supplied boiler circulator.
- b. The flow rate through the isolated near-boiler loop **is completely independent** of the flow rate through the heating system loop(s).
- c. The flow rate through the heating system loop(s) is controlled by installer sized/provided system loop circulator(s).
- d. This piping arrangement can be used either for space heating-only applications or space heating with indirect water heater(s) applications.
 - i. **Space heating only** - refer to Table 12A and Figures 31A or 31B “Near Boiler Piping - Heating Only” as applicable.
 - ii. **Space heating plus indirect water heater(s)** - refer to Tables 12A, 12B and, as applicable, to:
 - Figures 32A or 32B “Near Boiler Piping - Heating Plus Indirect Water Heater” - when indirect water heater can be piped as part of near-boiler piping.
 - Figures 32C or 32D “Near Boiler Piping - Heating Plus Indirect Water Heater” - when indirect water heater must be piped as a separate heating zone off the system header.
- e. For installations where indirect domestic hot water heater is combined with space heating, when sizing an indirect water heater circulator, compare the specified flow range through an Alpine model boiler to an indirect water heater (Alliance SL™) model coil flow rate required to achieve water heater rating. Refer to Table 12B.
- f. When Alliance SL™ model coil flow rate, required to achieve water heater rating, **falls within the specified flow range** for Alpine boiler model, the Alliance SL™ model **can be piped as part of Alpine near-boiler piping**. Refer to Table 12B, Figures 32A, 32B, 35 and 36 for recommended circulator models, piping and wiring details.
- g. When Alliance SL™ model coil flow rate, required to achieve water heater rating, **exceeds the specified flow range** for Alpine boiler model, the Alliance SL™/Alpine boiler combination may result in excessive noise and boiler heat exchanger erosion, and therefore, is **not recommended**. Refer to Table 12B for details.
- h. When Alliance SL™ model coil flow rate, required to achieve water heater rating, **falls below the specified flow range** for Alpine boiler model, the Alliance SL™ model must be **pipd as a separate heating zone off the system header**. The circulator must be sized based on the Alliance SL™ model coil flow and combined coil pressure drop and the zone piping total equivalent length. Refer to Table 12B, Figures 32C, 32D, 37A and 37B for piping and wiring details.

Table 12A: Recommended Circulator Models for Alpine (ALP) Boilers Based on 25°F Temperature Differential and Up to 75 ft. Equivalent Length Near-Boiler Piping - Space Heating Circulator

Boiler Model	Boiler Supply Connection, Inch, FPT	Boiler Return Connection, Inch, FPT	Near-Boiler Piping Supply Pipe Size, Inch	Near-Boiler Piping Return Pipe Size, Inch	Flow, GPM @ 25°F Temp. Differential	Combined Boiler & Piping Loop Head Loss, Ft.	* Recommended Circulator Make & Model
ALP080	1	1	1	1	5.8	10.3	Taco 0010 Grundfos UPS 15-58 FRC
ALP105	1	1	1	1	7.7	15.1	Taco 0014 Grundfos UPS 26-99 FC (second speed)
ALP150	1	1	1	1	11.0	13.1	Taco 0014 Grundfos UP 26-99 FC (first speed)
ALP210	1	1	1¼	1¼	15.5	12.7	Taco 0014 Grundfos UP 26-99 FC (first speed)
ALP285	1¼	1¼	1½	1½	21.5	13.0	Taco 0013 Grundfos UP 26-99 FC (third speed)
ALP399	1½	1½	2	2	30.2	12.0	Taco 1400-20 Grundfos UPS 32-80/2 F (second speed)

Notes:

* Circulator Models shown are not equipped with internal flow check valve (IFC).

When selecting Circulators with IFC contact Circulator Manufacturer for sizing information.

Near-Boiler Piping Size shown is based on 2 to 5.5 Ft/Sec. velocity range to avoid potential noise and pipe erosion.

**Table 12B: Recommended Circulator Models for Alpine (ALP) Boilers and Alliance SL Indirect Water Heaters
Installed as Part of Near-Boiler Piping Up to 75 Ft. Equivalent Length - Indirect Water Heater Circulator**

Boiler Model	Boiler Supply Connection, Inch, FPT	Boiler Return Connection, Inch, FPT	Near-Boiler Piping Supply Pipe Size, Inch	Near-Boiler Piping Return Pipe Size, Inch	Max Allowable Flow thru Boiler, GPM @ 20°F Delta T	Flow, GPM @ 25°F Delta T	Min Req'd Flow thru Boiler, GPM @ 35°F Delta T	Alliance SL Models to be installed As Part of Near-Boiler Piping	Alliance SL Coil Required Flow Rate, GPM	Alliance SL Coil Head Loss, Ft @ Required Flow Rate	Combined Boiler, Alliance SL & Piping Loop Head Loss, Ft	*Recommended Circulator Make & Model for Alliance SL installed as Part of Near-Boiler Piping	Reference Figure	Notes
ALP080	1	1	1	1	7.3	5.8	4.2	SL27	6	9	19.3	Taco 0010 Grundfos UPS26-99 FC (second speed)	32A or 32B	
								SL35	6	9	19.3			
								SL50	6	9.5	19.8			
								SL70	6	10	20.3			
								SL119	14	17	NA			
ALP105	1	1	1	1	9.6	7.7	5.5	SL27	6	9	19.3	Taco 0010 Grundfos UPS26-99 FC (second speed)	32A or 32B	
								SL35	6	9	19.3			
								SL50	6	9.5	19.8			
								SL70	6	10	20.3			
								SL119	14	17	NA			
ALP150	1	1	1	1	13.8	11	7.9	SL27	6	9	NA	Taco 1400-45 Grundfos UPS 32-80/2 (max speed)	32C or 32D	Note 2
								SL35	6	9	NA			
								SL50	6	9.5	NA			
								SL70	6	10	NA			
								SL119	14	17	36			

NOTES:

Note 1: Required Alliance SL Coil Flow Rate exceeds Max Allowable Flow Rate thru Boiler; this Boiler/Alliance SL combination may result in boiler heat exchanger erosion and noise.

Note 2: Required Alliance SL Coil Flow Rate is below Min Required Flow Rate thru Boiler; this Model can only be installed as separate heating zone off system header - see Figures 32C and 32D for alternate IWH piping. Indirect Water Heater Circulator must be selected by an installer based on Alliance SL required coil flow and corresponding coil head loss shown as well as total equivalent length of such separate zone.

Note 3: Combined Head Loss shown corresponds to Min Required Flow Rate thru Boiler.

* Circulator Models shown are not equipped with internal flow check valve (IFC).

When selecting Circulators with IFC contact Circulator Manufacturer for sizing information.

Near-Boiler Piping Size shown is based on 2 to 5.5 Ft/sec velocity range to avoid potential noise and pipe erosion.

Table 12B (continued): Space Heating with Indirect Water Heating - Recommended Circulator Models for Alpine (ALP) Boilers and Alliance SL Indirect Water Heaters Installed as Part of Near-Boiler Piping Up to 75 Ft. Equivalent Length

Boiler Model	Boiler Supply Connection, Inch, FPT	Boiler Return Connection, Inch, FPT	Near-Boiler Piping Supply Pipe Size, Inch	Near-Boiler Piping Return Pipe Size, Inch	Max Allowable Flow thru Boiler, GPM @ 20°F Delta T	Flow, GPM @ 25°F Delta T	Min Req'd Flow thru Boiler, GPM @ 35°F Delta T	Alliance SL Models to be installed As Part of Near-Boiler Piping	Alliance SL Coil Required Flow Rate, GPM	Alliance SL Coil Head Loss, Ft @ Required Flow Rate	Combined Boiler, Alliance SL & Piping Loop Head Loss, Ft	*Recommended Circulator Make & Model for Alliance SL installed as Part of Near-Boiler Piping	Reference Figure	Notes
ALP210	1	1	1-1/4	1-1/4	19.4	15.5	11.1	SL27	6	9	NA	Not Recommended	32C or 32D	Note 2
								SL35	6	9	NA	Not Recommended		
								SL50	6	9.5	NA	Not Recommended		
								SL70	6	10	NA	Not Recommended		
ALP285	1-1/4	1-1/4	1-1/2	1-1/2	26.5	21.2	15.1	SL119	14	17	29.7	Taco 1400-45 Grundfos UPS 32-80/2 (max speed)	32A or 32B	
								SL27	6	9	NA	Not Recommended		
								SL35	6	9	NA	Not Recommended		
								SL50	6	9.5	NA	Not Recommended		
ALP399	1-1/2	1-1/2	2	2	37.7	30.2	21.5	SL70	6	10	NA	Not Recommended	32C or 32D	Note 2
								SL119	14	40.1	NA	Not Recommended		
								SL27	6	9	NA	Not Recommended		
								SL35	6	9	NA	Not Recommended		

NOTES:

Note 1: Required Alliance SL Coil Flow Rate exceeds Max Allowable Flow Rate thru Boiler; this Boiler/Alliance SL combination may result in boiler heat exchanger erosion and noise.

Note 2: Required Alliance SL Coil Flow Rate is below Min Required Flow Rate thru Boiler; this Model can only be installed as separate heating zone off system header - see Figures 32C and 32D for alternate IWH piping. Indirect Water Heater Circulator must be selected by an installer based on Alliance SL required coil flow and corresponding coil head loss shown as well as total equivalent length of such separate zone.

Note 3: Combined Head Loss shown corresponds to Min Required Flow Rate thru Boiler.

* Circulator Models shown are not equipped with internal flow check valve (IFC).

When selecting Circulators with IFC contact Circulator Manufacturer for sizing information.

Near-Boiler Piping Size shown is based on 2 to 5.5 Ft/sec velocity range to avoid potential noise and pipe erosion.

Table 13: Fitting and Valve Equivalent Length

Copper Fitting and Sweat Valve Equivalent Length (Ft)			
Fitting or Valve Description	Copper Pipe or Valve Size		
	1	1¼	1½
90° Elbow	2.5	3.0	4.0
45° Elbow	1.0	1.2	1.5
Tee (thru flow)	0.5	0.6	0.8
Tee (Branch flow)	4.5	5.5	7.0
Diverter Tee (typical)	23.5	25.0	23.0
Gate Valve	0.3	0.4	0.5
Globe Valve	25.0	36.0	46.0
Angle Valve	5.3	7.8	9.4
Ball Valve (standard port)	4.3	7.0	6.6
Swing Check Valve	4.5	5.5	6.5
Flow-Check Valve (typical)	54.0	74.0	57.0
Butterfly Valve	2.7	2.0	2.7

Table 13: Fitting and Valve Equivalent Length (cont'd)

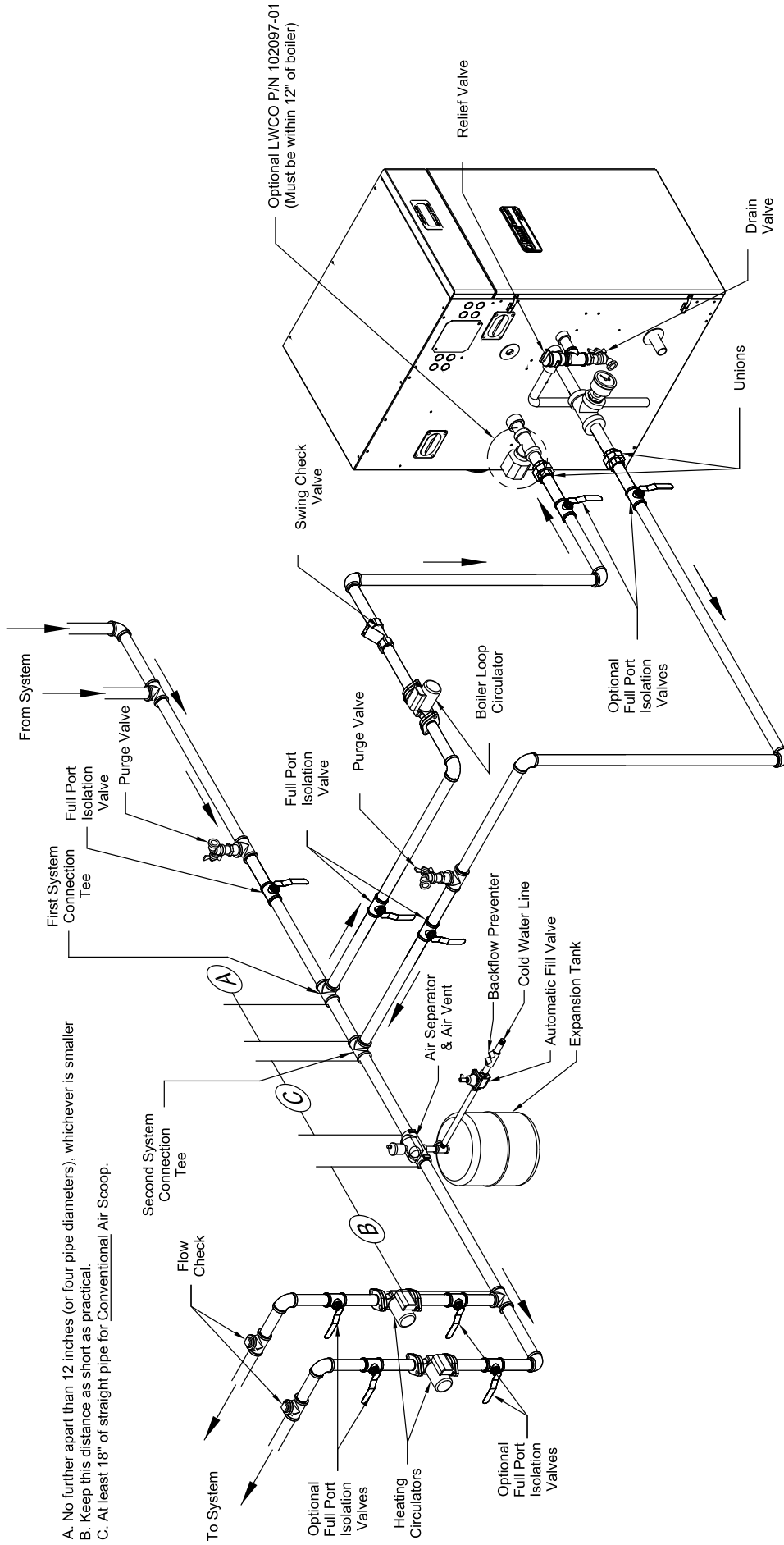
Threaded Fitting and Valve Equivalent Length (Ft)			
Fitting or Valve Description	Black Threaded Pipe or Valve Size		
	1	1¼	1½
90° Elbow	2.6	3.5	4.0
Long Radius Elbow (45° or 90°)	1.4	1.8	2.2
Tee (thru flow)	1.8	2.3	2.7
Tee (Branch flow)	5.3	6.9	8.1
Close Return Bend	4.4	5.8	6.7
Gate Valve (full open)	0.7	0.9	1.1
Globe Valve (full open)	30.0	39.0	46.0
Angle Valve (full open)	13.0	17.0	20.0
Swing Check Valve (full open)	8.7	12.0	13.0
Flow-Check Valve (typical)	42.0	60.0	63.0

NOTE: Table 13 is provided as reference to assist in piping design and specifies equivalent length of typical piping fittings and valves.

NOTICE

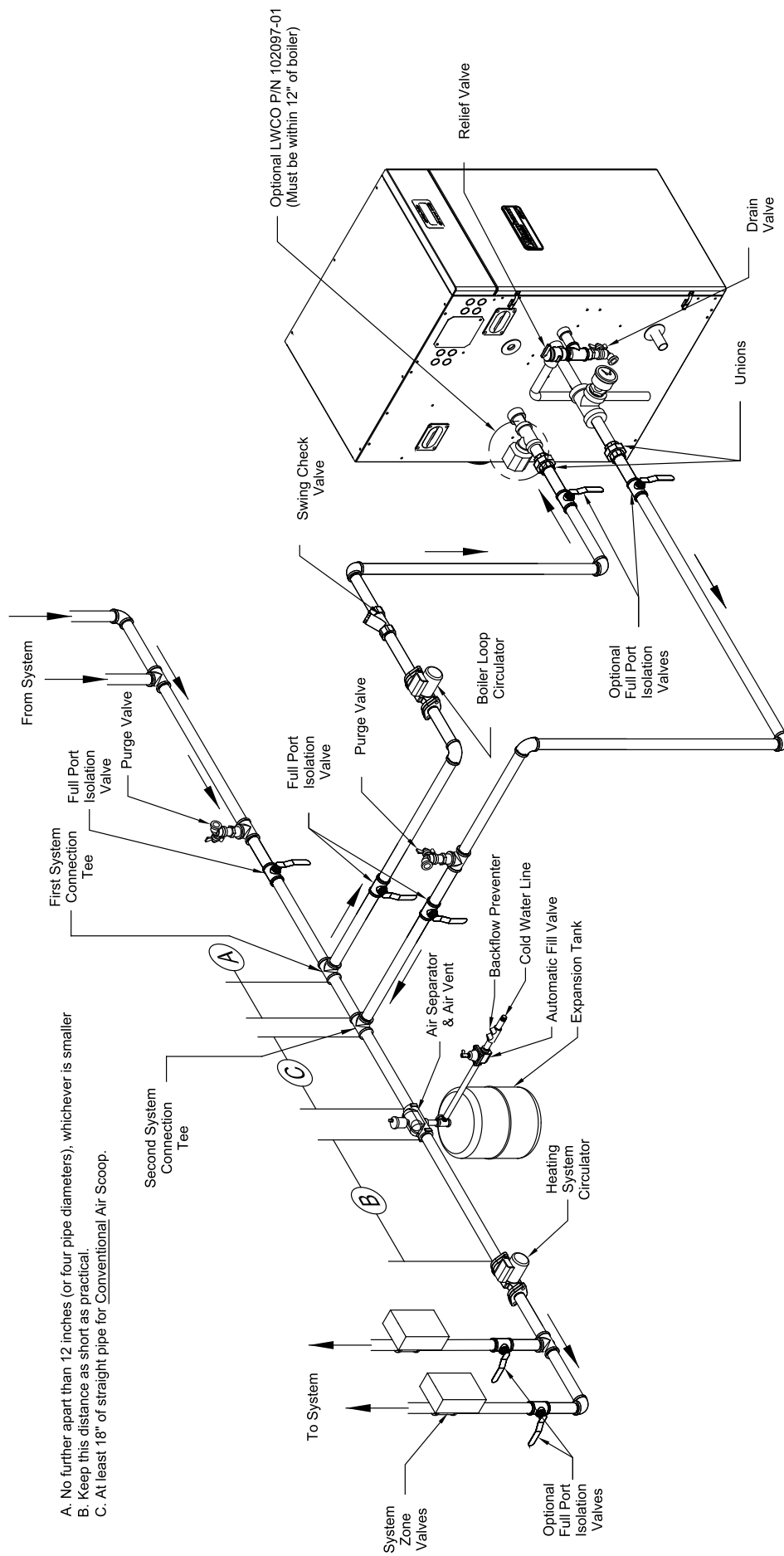
The Alpine (ALP) boiler heat exchanger is made from stainless steel tubular coil having relatively narrow waterways. Once filled with water, it will be subject to the effects of corrosion. Failure to take the following precautions to minimize corrosion and heat exchanger waterways overheating could result in severe boiler damage.

- Before connecting the boiler, insure the system is free of impurities, grease, sediment, construction dust, sand, copper dust, flux and any residual boiler water additives. Flush the system thoroughly and repeatedly, if needed, with clear water mixed with concentrated rinse agent to remove these contaminants completely.
- Iron oxide (red oxide sludge Fe_2O_3) is produced during oxygenation. To minimize any oxygen presence in the system, the system must be air free and leak tight. Do not connect the boiler to radiant tubing without an oxygen barrier. Using automatic water refill is not recommended, however, if such refill is employed, a water meter must be added to evaluate the makeup water volume taken after initial fill and eliminate any water leakage as early as possible.
- Maintain the water pressure in the boiler at a minimum of 12 PSI.
- The boiler water pH must be within $8.2 < \text{pH} < 9.5$. If the system contains any aluminum components, pH must be less than 8.5.
- Black oxide sludge (magnetite Fe_3O_4) forms as the result of continuous electrolytic corrosion in any system not protected by an inhibitor.
- Scale deposit is made up of lime scale contained in most distributed water and settles over the warmest surfaces of boiler heat exchanger causing subsequent overheating and eventual failure. Water hardness must be maintained within 3 to 9 grain/gal range.
- Refer to Section XIII "Service and Maintenance" for recommended heating system water treatment products (corrosion/scale inhibitors, cleaners etc) and their suppliers.



- A. No further apart than 12 inches (or four pipe diameters), whichever is smaller
- B. Keep this distance as short as practical.
- C. At least 18" of straight pipe for Conventional Air Scoop.

Figure 31A: Near Boiler Piping - Heating Only (with Central Heating Circulators)



- A. No further apart than 12 inches (or four pipe diameters), whichever is smaller
- B. Keep this distance as short as practical.
- C. At least 18" of straight pipe for Conventional Air Scoop.

Figure 31B: Near Boiler Piping - Heating Only (with Central Heating Zone Valves)

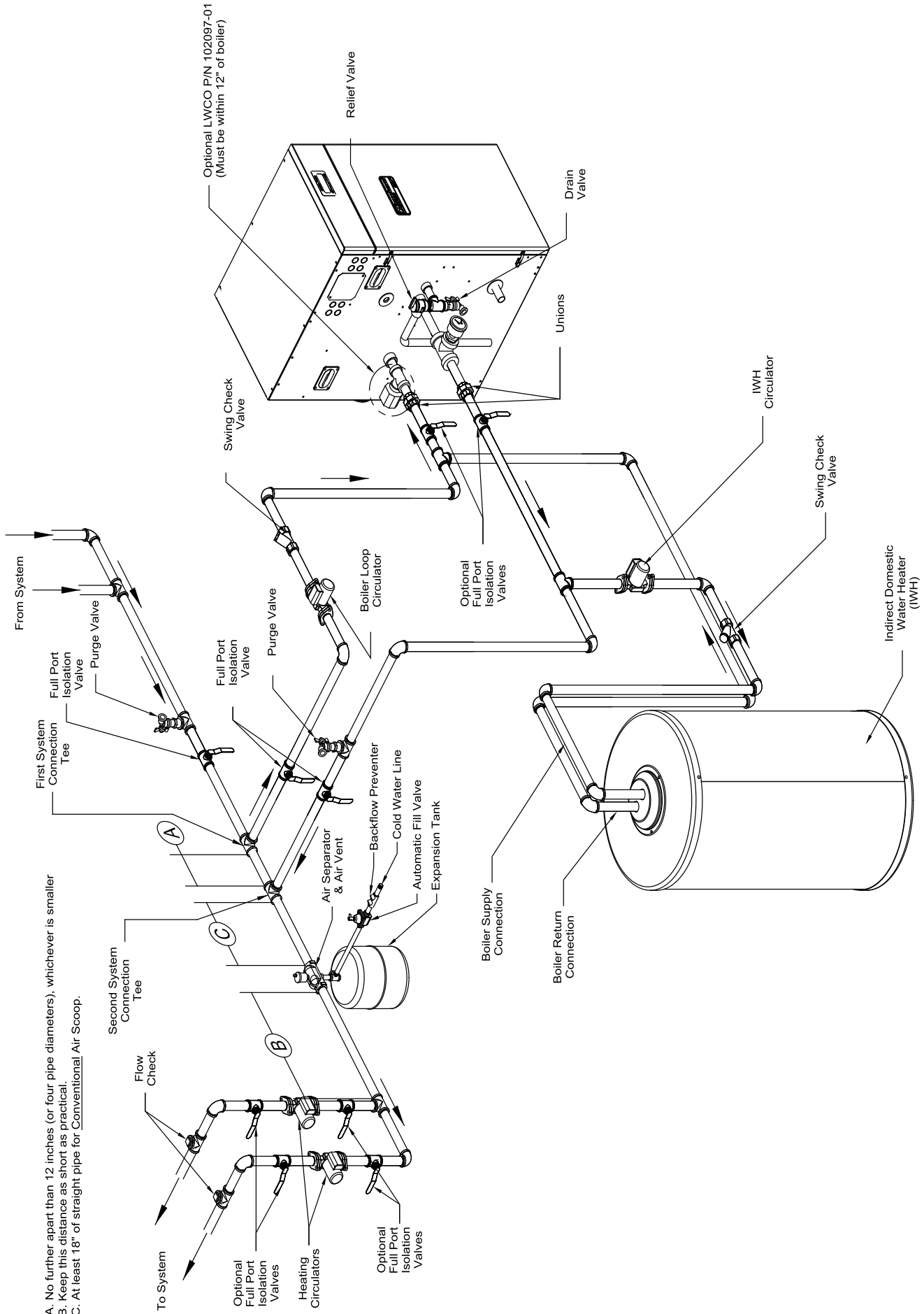


Figure 32A: Near Boiler Piping - Heating Plus Indirect Water Heater (with Central Heating Circulators)

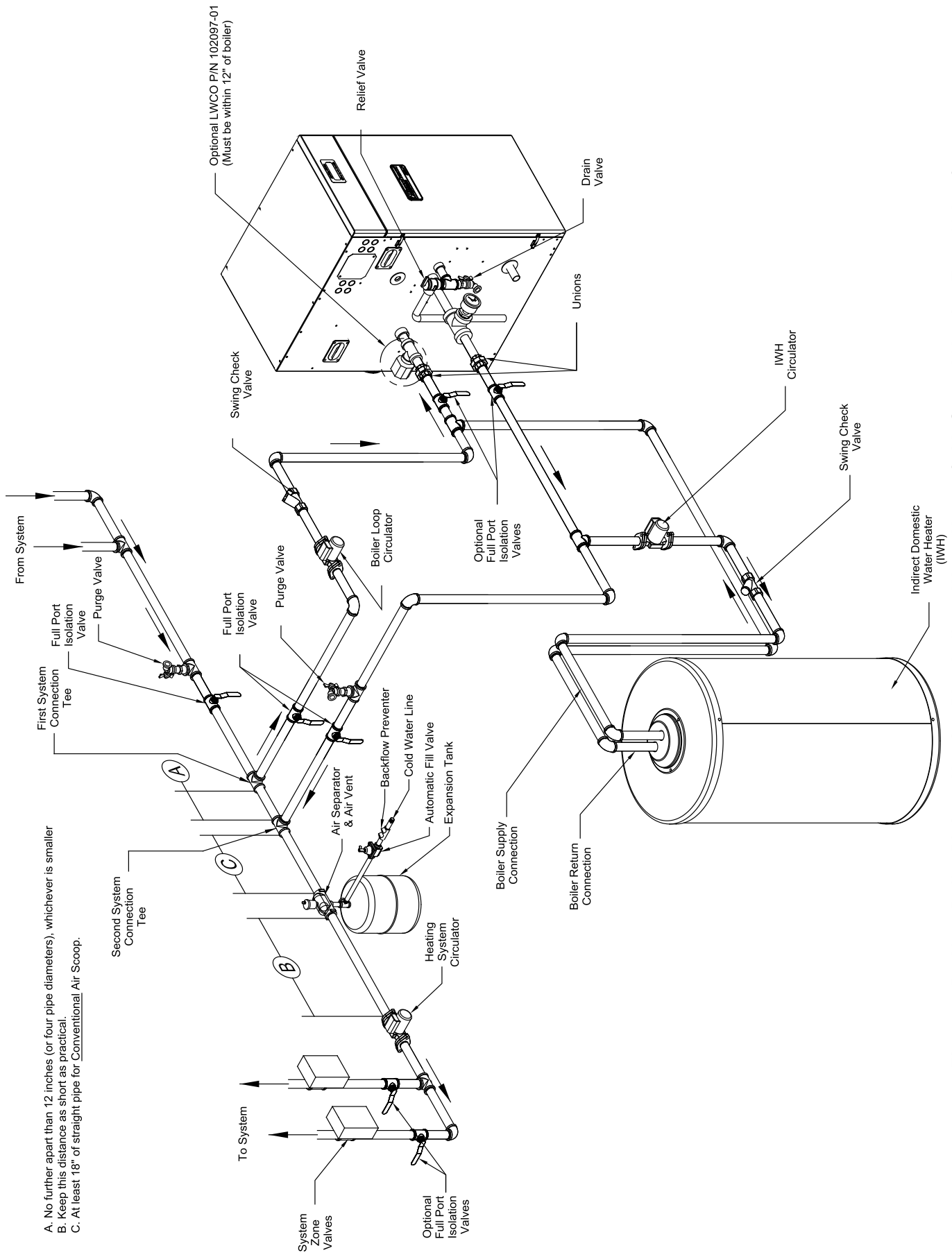


Figure 32B: Near Boiler Piping - Heating Plus Indirect Water Heater (with Central Heating Zone Valves)

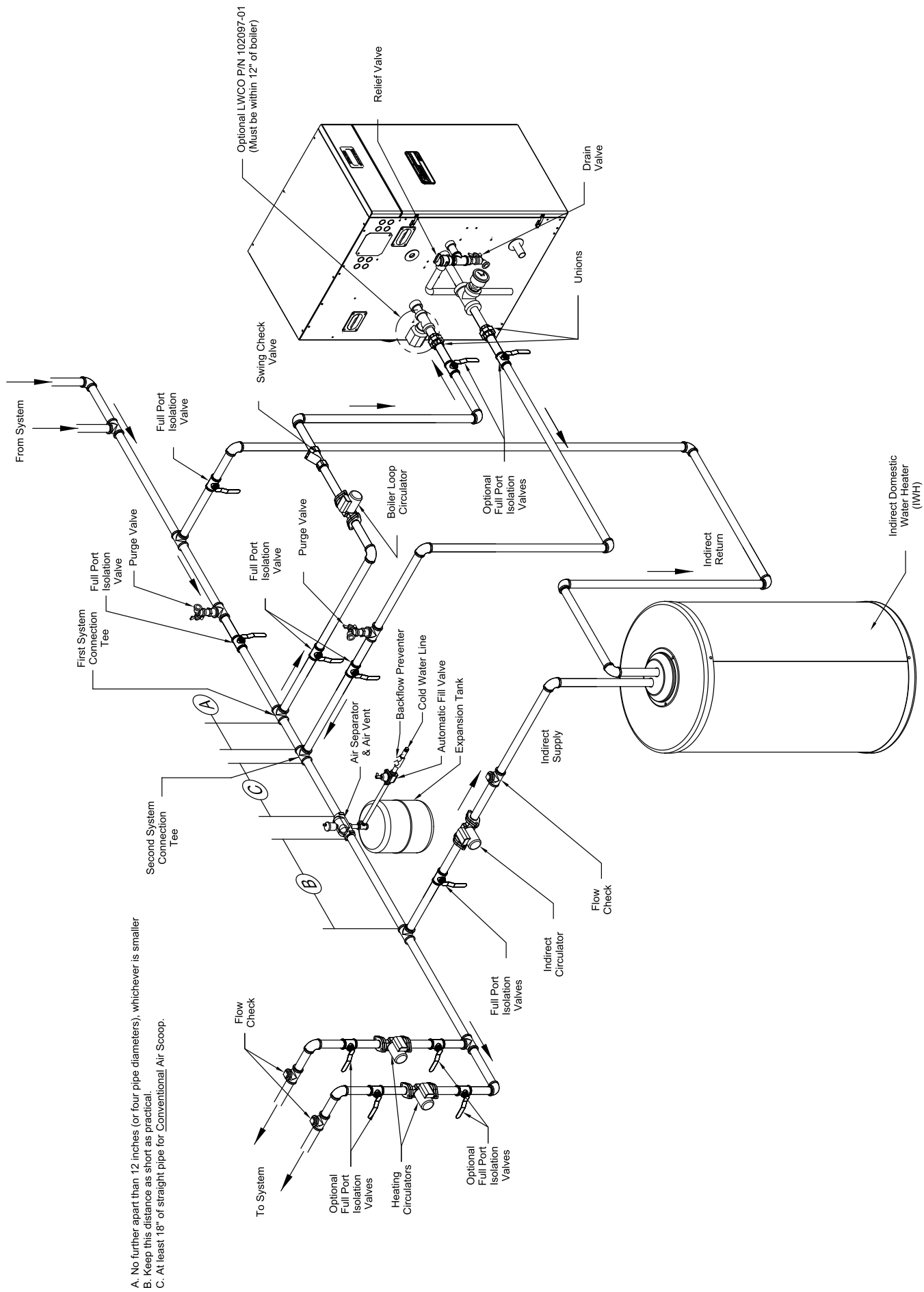


Figure 32C: Near Boiler Piping - Heating (with Central Heating Circulators) Plus Alternately Piped Indirect Water Heater

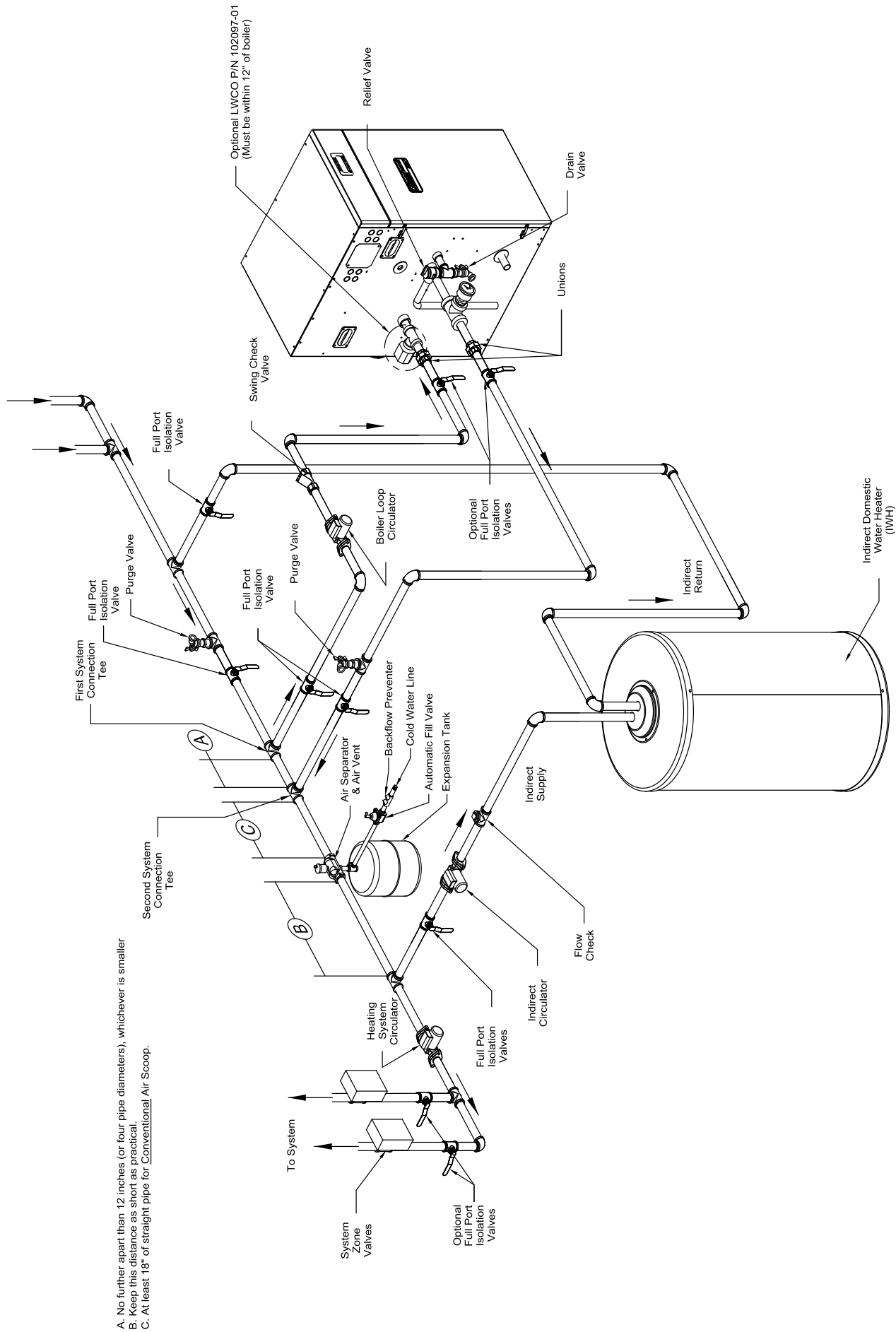


Figure 32D: Near Boiler Piping - Heating (with Central Heating Zone Valves) Plus Alternately Piped Indirect Water Heater

NOTICE

Where it is not possible to install a separate boiler loop, the system circulator must be sized to ensure that the flow through boiler stays within the defined parameters to prevent overheating when the boiler is fired at it's full rated input. Install a flow meter to measure the flow, or fire the boiler at full rate and ensure the boiler ΔT does not exceed 35°F.

2. **Direct connection of Alpine (ALP) boiler to heating system**, similar to a conventional boiler, is NOT RECOMMENDED because:
 - a. The flow rate through system must be the same as through boiler and fall within limits specified in Table 11.
 - b. Pressure drop through entire system must be known, added to pressure drop through boiler, and, a circulator selected to provide required flow at total calculated pressure drop.
 - c. It is often very difficult to accurately calculate the pressure drop through the system.
 - d. In replacement installations, it may be nearly impossible to get an accurate measurement of piping amount and number of fittings in the system. If system is zoned, the system flow rate may drop well below recommended minimum flow when only a single zone is calling for heat.

C. Piping Standard Installation Requirements.

Observe the following guidelines when making the actual installation of the boiler piping:

1. **Pressure Relief Valve (Required)** - The relief valve is packaged loose with boiler and must be installed in the location shown in Figure 30 "Factory Supplied Piping and Trim Installation". The relief valve must be installed with spindle in vertical position. Installation of the relief valve must comply with ASME Boiler and Pressure Vessel Code, Section IV. The standard factory shipped relief valve is rated for 30 PSI maximum working pressure. Optional 50 PSI maximum working pressure rated relief valve is available. If the valve is to be replaced, the replacement valve must have a relief capacity equal or exceeding the boiler DOE Heating Capacity (models ALP080 thru ALP285) or the boiler I=B=R Gross Output rating (model ALP399). Pipe the relief valve discharge to a location where hot water or steam will not create hazard or property damage if the valve opens. The end of the discharge pipe must terminate in an unthreaded pipe. If the relief valve is not piped to a drain, it must terminate at least 6" above the floor. Do not run relief valve discharge piping through an area prone to freezing. The termination of discharge piping must be in an area where it will not become plugged by debris.

WARNING

Pressure relief valve discharge piping must be piped such that the potential of severe burns is eliminated. DO NOT pipe in any area where freezing could occur. DO NOT install any shut-off valves, plugs or caps. Consult Local Codes for proper discharge piping arrangement.

2. **Circulator (Required)** – Usually at least two circulators will be required to properly install a Alpine™ Series boiler. See Section B above for information on sizing the circulators.
3. **Expansion Tank (Required)** - If this boiler is replacing an existing boiler with no other changes in the system, the old expansion tank can generally be reused. If the expansion tank must be replaced, consult the expansion tank manufacturer's literature for proper sizing.
4. **Fill Valve (Required)** – Either manual (recommended) or automatic fill valve may be used. However, if automatic refill is employed, a water meter must be added to evaluate the makeup water volume taken after initial fill and eliminate any water leakage as early as possible.
5. **Automatic Air Vent (Required)** -At least one automatic air vent is required. Manual vents will usually be required in other parts of the system to remove air during initial fill.
6. **Manual Reset High Limit (Required by some Codes)** - This control is required by ASME CSD-1 and some other codes. Install the high limit in the boiler supply piping just above the boiler with no intervening valves. Set the manual reset high limit to 200°F. Wire the limit per Figures 36, 37A and 37B in VIII Electrical Section.
7. **Flow Control Valve (Strongly Recommended)** - The flow control valve prevents flow through the system unless the circulator is operating. Flow control valves are used to prevent gravity circulation or "ghost flows" in circulator zone systems through zones that are not calling for heat.
8. **Isolation Valves (Strongly recommended)** - Isolation valves are useful when the boiler must be drained, as they will eliminate having to drain and refill the entire system.
9. **Drain Valve (Required)** – Drain valve is packaged loose with boiler and must be installed in the location shown in Figure 30 "Factory Supplied Piping and Trim Installation".
10. **Low Water Cutoff (Required by some Codes)** – LWCO with harness and LWCO transformer are available as optional components. Order Complete Kit (Part No. 102097-01) when required.

D. Special Situation Piping Installation Requirements

Observe the following guidelines when making the actual installation of the boiler piping for special situations:

1. Systems containing high level of dissolved oxygen
– Many hydronic systems contain enough dissolved oxygen to cause severe corrosion damage to Alpine (ALP) boiler heat exchanger. Some examples include but not limited to:

- Radiant systems employing tubing without oxygen barrier
- Systems with routine additions of fresh water
- Systems open to atmosphere

If the boiler is used in such a system, it must be separated from oxygenated water being heated with

a heat exchanger as shown in Figure 33. Consult the heat exchanger manufacturer for proper heat exchanger sizing as well as flow and temperature requirements. All components on the oxygenated side of the heat exchanger, such as the pump and expansion tank, must be designed for use in oxygenated water.

2. Piping with a Chiller - If the boiler is used in conjunction with a chiller, pipe the boiler and chiller in parallel. Use isolation valves to prevent chilled water from entering the boiler.
3. Boiler Piping with Air Handlers - Where the boiler is connected to air handlers through which refrigerated air passes, use flow control valves in the boiler piping or other automatic means to prevent gravity circulation during the cooling cycle.

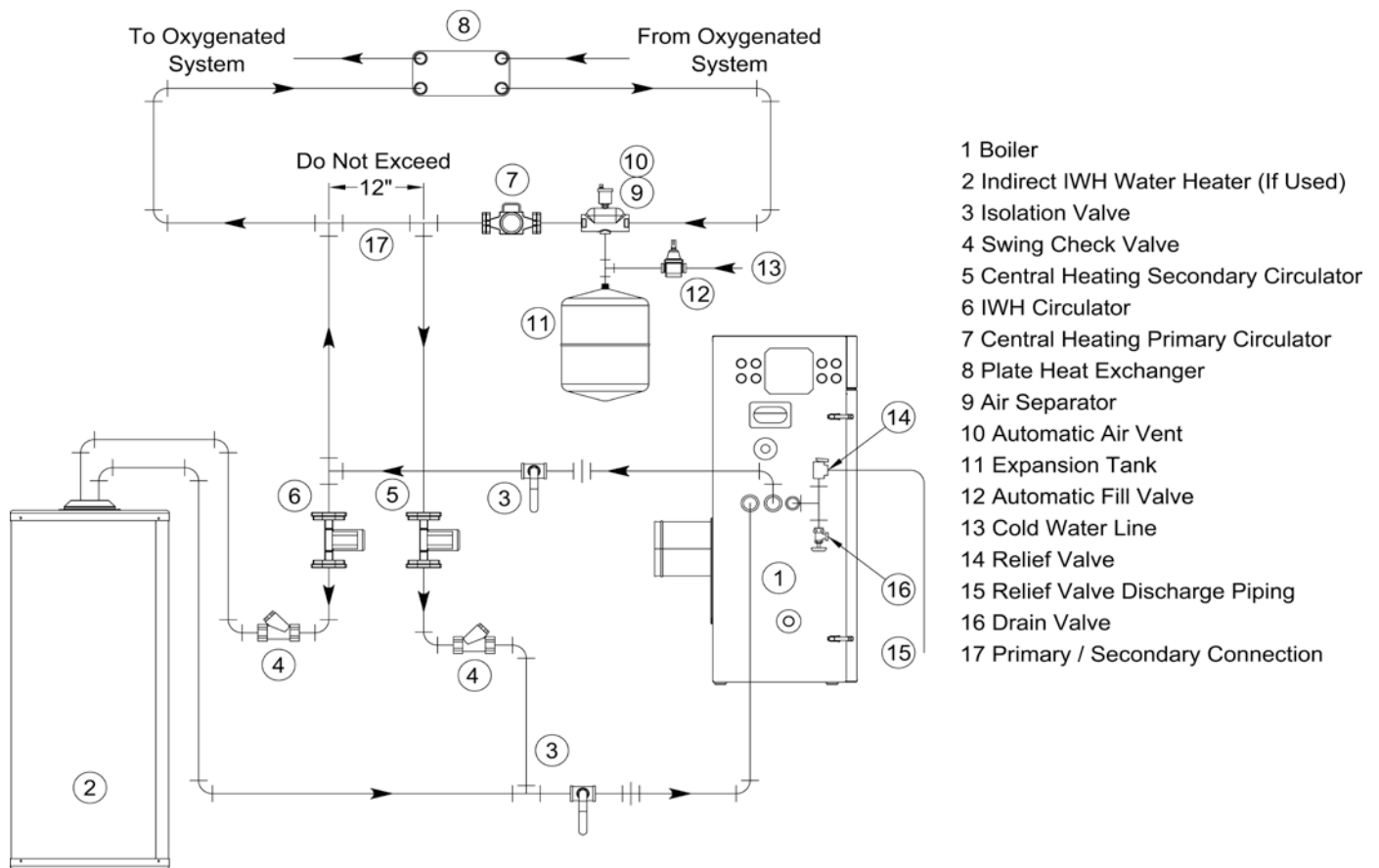


Figure 33: Isolation of the Boiler From Oxygenated Water with A Plate Heat Exchanger

VII. Gas Piping

WARNING

Failure to properly pipe gas supply to boiler may result in improper operation and damage to the boiler or structure. Always assure gas piping is absolutely leak free and of the proper size and type for the connected load.

An additional gas pressure regulator may be needed. Consult gas supplier.

A. Size gas piping. Design system to provide adequate gas supply to boiler. Consider these factors:

1. Allowable pressure drop from point of delivery to boiler. Maximum allowable system pressure is ½ psig. Actual point of delivery pressure may be less; contact gas supplier for additional information. Minimum gas valve inlet pressure is stamped on the rating label located in the boiler's vestibule compartment.
2. Maximum gas demand. Refer to the boiler's input as printed on its rating label. Also consider existing and expected future gas utilization equipment (i.e. water heater, cooking equipment).

3. Length of piping and number of fittings. Refer to Tables 14A (natural gas) or 14B (LP gas) for maximum capacity of Schedule 40 pipe. Table 15 lists equivalent pipe length for standard fittings.
4. Specific gravity of gas. Gas piping systems for gas with a specific gravity of 0.60 or less can be sized directly from Tables 14A or 14B, unless authority having jurisdiction specifies a gravity factor be applied. For specific gravity greater than 0.60, apply gravity factor from Table 16. If exact specific gravity is not shown choose next higher value.

For materials or conditions other than those listed above, refer to *National Fuel Gas Code*, NFPA54/ANSI Z223.1, or size system using standard engineering methods acceptable to authority having jurisdiction.

B. Connect boiler gas valve to gas supply system.

WARNING

Failure to use proper thread compounds on all gas connectors may result in leaks of flammable gas.

Table 14A: Maximum Capacity of Schedule 40 Black Pipe in CFH* (Natural Gas) For Gas Pressures of 0.5 psig or Less

Inlet Pressure 0.5 PSI or less; 0.3 Inch W.C. Pressure Drop											
Nominal Pipe Size, In.	Inside Diameter, In.	Length of Pipe, Ft.									
		10	20	30	40	50	60	70	80	90	100
½	0.622	131	90	72	62	55	50	46	42	40	38
¾	0.824	273	188	151	129	114	104	95	89	83	79
1	1.049	514	353	284	243	215	195	179	167	157	148
1¼	1.380	1056	726	583	499	442	400	368	343	322	304
1½	1.610	1582	1087	873	747	662	600	552	514	482	455
2	2.067	3046	2094	1681	1439	1275	1156	1063	989	928	877
2½	2.469	4856	3337	2680	2294	2033	1842	1695	1576	1479	1397
3	3.068	8584	5900	4738	4055	3594	3256	2996	2787	2615	2470

Inlet Pressure 0.5 PSI or less; 0.5 Inch W.C. Pressure Drop											
Nominal Pipe Size, In.	Inside Diameter, In.	Length of Pipe, Ft.									
		10	20	30	40	50	60	70	80	90	100
½	0.622	172	118	95	81	72	65	60	56	52	50
¾	0.824	360	247	199	170	151	137	126	117	110	104
1	1.049	678	466	374	320	284	257	237	220	207	195
1¼	1.380	1392	957	768	657	583	528	486	452	424	400
1½	1.610	2085	1433	1151	985	873	791	728	677	635	600
2	2.067	4016	2760	2217	1897	1681	1523	1402	1304	1223	1156
2½	2.469	6401	4400	3533	3024	2680	2428	2234	2078	1950	1842
3	3.068	11316	7778	6246	5345	4738	4293	3949	3674	3447	3256

* 1 CFH of Natural Gas is approximately equal to 1 MBH; contact your gas supplier for the actual heating value of your gas.

Table 14B: Maximum Capacity of Schedule 40 Black Pipe in CFH* (LP Gas) For Gas Pressures of 0.5 psig or Less

Inlet Pressure 11.0 Inch W.C.; 0.3 Inch W.C. Pressure Drop											
Nominal Pipe Size, In.	Inside Diameter, In.	Length of Pipe, Ft.									
		10	20	30	40	50	60	70	80	90	100
½	0.622	88	60	48	41	37	33	31	29	27	25
¾	0.824	184	126	101	87	77	70	64	60	56	53
1	1.049	346	238	191	163	145	131	121	112	105	100
1¼	1.380	710	488	392	336	297	269	248	231	216	204
1½	1.610	1064	732	588	503	446	404	371	346	324	306
2	2.067	2050	1409	1131	968	858	778	715	666	624	590
2½	2.469	3267	2246	1803	1543	1368	1239	1140	1061	995	940
3	3.068	5776	3970	3188	2729	2418	2191	2016	1875	1760	1662

Inlet Pressure 11.0 Inch W.C.; 0.5 Inch W.C. Pressure Drop											
Nominal Pipe Size, In.	Inside Diameter, In.	Length of Pipe, Ft.									
		10	20	30	40	50	60	70	80	90	100
½	0.622	116	80	64	55	48	44	40	38	35	33
¾	0.824	242	166	134	114	101	92	85	79	74	70
1	1.049	456	314	252	215	191	173	159	148	139	131
1¼	1.380	937	644	517	442	392	355	327	304	285	269
1½	1.610	1403	964	775	663	588	532	490	456	427	404
2	2.067	2703	1858	1492	1277	1131	1025	943	877	823	778
2½	2.469	4308	2961	2377	2035	1803	1634	1503	1399	1312	1239
3	3.068	7615	5234	4203	3597	3188	2889	2658	2472	2320	2191

* 1 CFH of LP Gas is approximately equal to 2.5 MBH; contact your gas supplier for the actual heating value of your gas.

Table 15: Equivalent Lengths of Standard Pipe Fittings & Valves

Nominal Pipe Size, Inc.	Inside Diameter, In.	Valves (Screwed) - Fully Open				Screwed Fittings				
		Gate	Globe	Angle	Swing Check	45° Elbow	90° Elbow	180 Close Return Bend	90 Tee Flow Thru Run	90 Tee, Flow Thru Branch
½	0.622	0.4	17.3	8.7	4.3	0.7	1.6	3.5	1.6	3.1
¾	0.824	0.5	22.9	11.4	5.7	1.0	2.1	4.6	2.1	4.1
1	1.049	0.6	29.1	14.6	7.3	1.2	2.6	5.8	2.6	5.2
1¼	1.38	0.8	38.3	19.1	9.6	1.6	3.5	7.7	3.5	6.9
1½	1.61	0.9	44.7	22.4	11.2	1.9	4.0	9.0	4.0	8.0
2	2.067	1.2	57.4	28.7	14.4	2.4	5.2	11.5	5.2	10.3
2½	2.469	1.4	68.5	34.3	17.1	2.9	6.2	13.7	6.2	12.3
3	3.068	1.8	85.2	42.6	21.3	3.6	7.7	17.1	7.7	15.3

Table 16: Specific Gravity Correction Factors

Specific Gravity	Correction Factor	Specific Gravity	Correction Factor
0.60	1.00	0.90	0.82
0.65	0.96	1.00	0.78
0.70	0.93	1.10	0.74
0.75	0.90	1.20	0.71
0.80	0.87	1.30	0.68
0.85	0.81	1.40	0.66

WARNING

Gas supply to boiler and system must be absolutely shut off prior to installing or servicing boiler gas piping.

1. Use methods and materials in accordance with local plumbing codes and requirements of gas supplier. In absence of such requirements, follow *National Fuel Gas Code*, NFPA 54/ANSI Z223.1.
2. Use thread (joint) compounds (pipe dope) resistant to action of liquefied petroleum gas.
3. Alpine (ALP) boilers have factory supplied Miscellaneous Part Carton (P/N 101777-01 - ALP080 thru ALP210; 101777-02 - ALP285; 101777-03 - ALP399), which includes gas piping components to connect boiler gas valve to gas supply system. Install these components prior to connecting boiler to gas supply system piping as follows:
 - a. Locate and remove either ½" NPT x 6" long black nipple and ½" NPT external gas shutoff valve (ALP080 thru ALP210), or ¾" NPT x 6" long black nipple and ¾" NPT external gas shutoff valve (ALP285 thru ALP399).
 - b. Feed the appropriate nipple through factory installed jacket left side panel grommet (refer to Figure 1A or 1B for gas supply connection identification) and screw the nipple into boiler gas valve inlet port.
 - c. Mount the appropriate external gas shutoff valve onto the threaded nipple end outside of the jacket left side panel.
 - d. Install sediment trap, ground-joint union and manual shut-off valve upstream of boiler gas control valve and outside jacket. See Figure 34.
4. All above ground gas piping upstream from manual shut-off valve must be electrically continuous and bonded to a grounding electrode. Do not use gas piping as grounding electrode. Refer to *National Electrical Code*, NFPA 70.

C. Pressure test. See Table 17 for Alpine Min./Max.

Pressure Ratings. The boiler and its gas connection must be leak tested before placing boiler in operation.

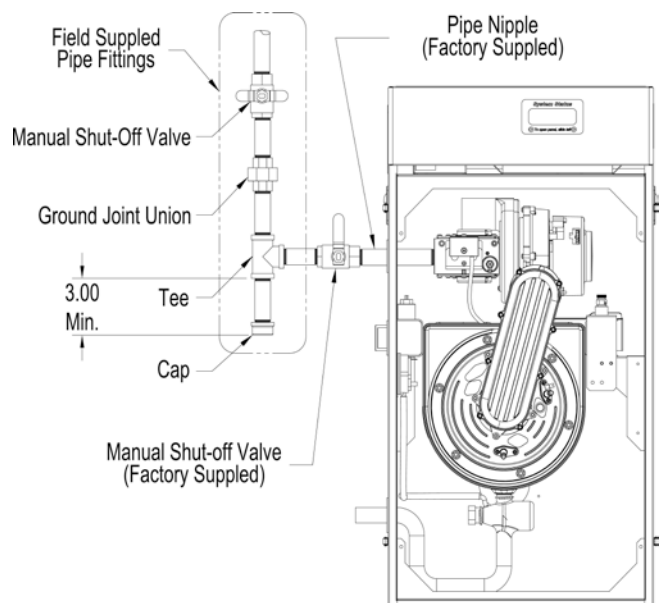
1. Protect boiler gas control valve. For all testing over ½ psig, boiler and its individual shutoff valve must be disconnected from gas supply piping. For testing at ½ psig or less, isolate boiler from gas supply piping by closing boiler's individual manual shutoff valve.
2. Locate leaks using approved combustible gas non-corrosive leak detector solution.

DANGER

Do not use matches, candles, open flames or other ignition source to check for leaks.

Table 17: Min./Max. Pressure Ratings

Boiler Model No.	Natural/LP Gas Max. Pressure (in. w.c.)	Natural Gas Min. Pressure Inlet to Gas Valve (in. w.c.)	LP Gas Min. Pressure Inlet to Gas Valve (in. w.c.)
ALP080	14	4.0	11.0
ALP105			
ALP150			
ALP210			
ALP285			
ALP399			

**Figure 34: Recommended Gas Piping**

VIII. Electrical

DANGER

Positively assure all electrical connections are unpowered before attempting installation or service of electrical components or connections of the boiler or building. Lock out all electrical boxes with padlock once power is turned off.

WARNING

Failure to properly wire electrical connections to the boiler may result in serious physical harm.

Electrical power may be from more than one source. Make sure all power is off before attempting any electrical work.

Each boiler must be protected with a properly sized over-current device.

Never jump out or make inoperative any safety or operating controls.

The wiring diagrams contained in this manual are for reference purposes only. Each boiler is shipped with a wiring diagram attached to the front door. Refer to this diagram and the wiring diagram of any controls used with the boiler. Read, understand and follow all wiring instructions supplied with the controls.

A. General. Install wiring and electrically ground boiler in accordance with authority having jurisdiction or, in the absence of such requirements, follow the *National Electrical Code*, NFPA 70, and/or CSA C22.1 Electrical Code.

B. A separate electrical circuit must be run from the main electrical service with an over-current device/disconnect in the circuit. A service switch is recommended and may be required by some local jurisdictions. Install the service switch in the line voltage “Hot” leg of the power supply. Locate the

service switch such that the boiler can be shut-off without exposing personnel to danger in the event of an emergency. Connect the main power supply and ground to the three (3) boiler wires (black, white and green) located in the junction box at the inside top of the boiler jacket.

C. Refer to Figures 35 and 36 or details on the internal boiler wiring.

1. Line Voltage (120 VAC) Connections (Figure 35)
 - The line voltage connections are located in the junction box on the left side of the vestibule:

NOTICE

This boiler is equipped with a high water temperature limit located inside the internal wiring of the boiler. This limit provides boiler shutdown in the event the boiler water temperature exceeds the set point of the limit control. Certain Local Codes require an additional water temperature limit. In addition, certain types of systems may operate at temperatures below the minimum set point of the limit contained in the boiler.

If this occurs, install an additional water temperature limit (Honeywell L4006 Aquastat) located in the system piping as shown in the Water Piping and Trim Section of this manual. Wire as indicated in the Electrical Section of this manual.

NOTICE

All wire, wire nuts, controls etc. are installer supplied unless otherwise noted.

- Black – Line voltage “hot”
 - White – “Neutral” for boiler and circulators
 - Red – “Heating” circulator “hot”
 - Blue – “Indirect Water Heater “ circulator “hot”
 - Green – Ground connection
2. Maximum circulator continuous current draw is 2A. With primary/secondary piping, it may be desirable to use the boiler to directly control the primary circulator in addition to the secondary circulator. If this is done, control both heating circulators using a relay with a 120VAC coil, such as a Honeywell R4222, as shown in Figures 37A and 37B. Select a relay with a contact rating in excess of the combined draw of the two circulators.
 3. Low Voltage Connections (Figure 35) – These connections are screw terminals located on the terminal strip next to the junction box on the left:
 - Terminals 1 and 8 – “Heating” thermostat connections
 - Terminals 5 and 6 – “External Limit Control” connections
 - Terminals 3 and 4 – “Outdoor Reset Sensor” connections
 - Terminals 2 and 4 – “Domestic Indirect Water Heater” thermostat connections
 - Terminal 7 – “Flame Signal Reading”
 - Heat anticipator setting for the thermostat connection is 0.1 A when thermostat is connected directly to terminals 1 and 8.

WARNING

When making low voltage connections, make sure that no external power source is present in the thermostat or limit circuits. If such a power source is present, it could destroy the boiler’s Microprocessor Control (MCBA). One example of an external power source that could be inadvertently connected to the low voltage connections is a transformer in old thermostat wiring.

4. If the outdoor sensor is connected to terminals 3 and 4, the boiler will adjust the target space heating set point supply water temperature downwards as the outdoor air temperature increases. If used, this sensor should be located on the outside of the structure in an area where it will sense the average air temperature around the house. Avoid placing this sensor in areas where it may be covered with ice or snow. In general, locations where the sensor will pick up direct radiation from the sun should also be avoided. Avoid placing the sensor near potential sources of electrical noise such as transformers, power lines, and fluorescent lighting. Wire the sensor to the boiler using 22 gauge or larger wire. As with the sensor, the sensor wiring should be routed away from sources of electrical noise. Where it is impossible to avoid such noise sources, wire the sensor using a 2 conductor, UL Type CM, AWM Style 2092, 300Volt 60°C shielded cable. Connect one end of the shielding on this cable to ground.

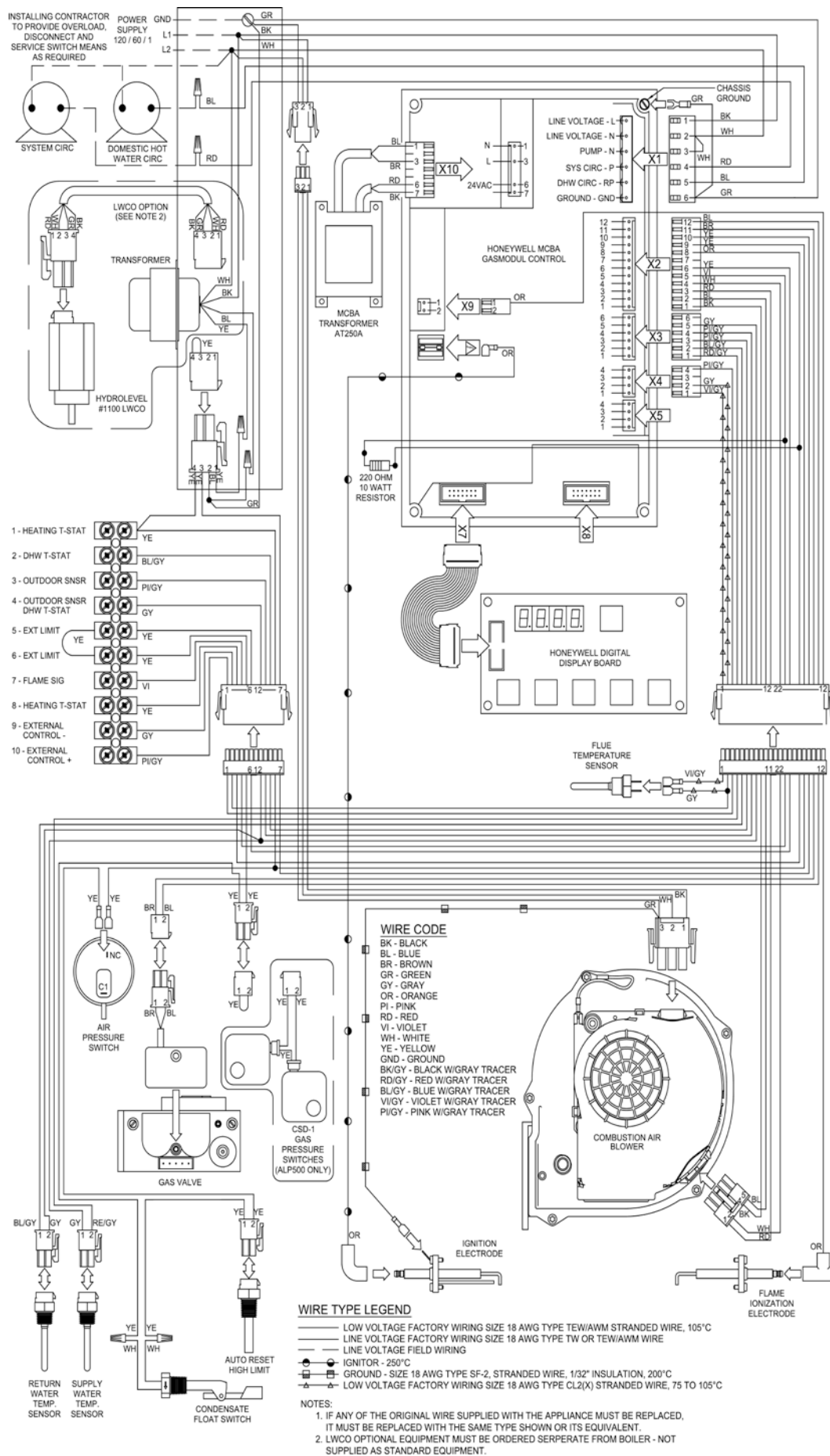


Figure 35: Wiring Connections Diagram

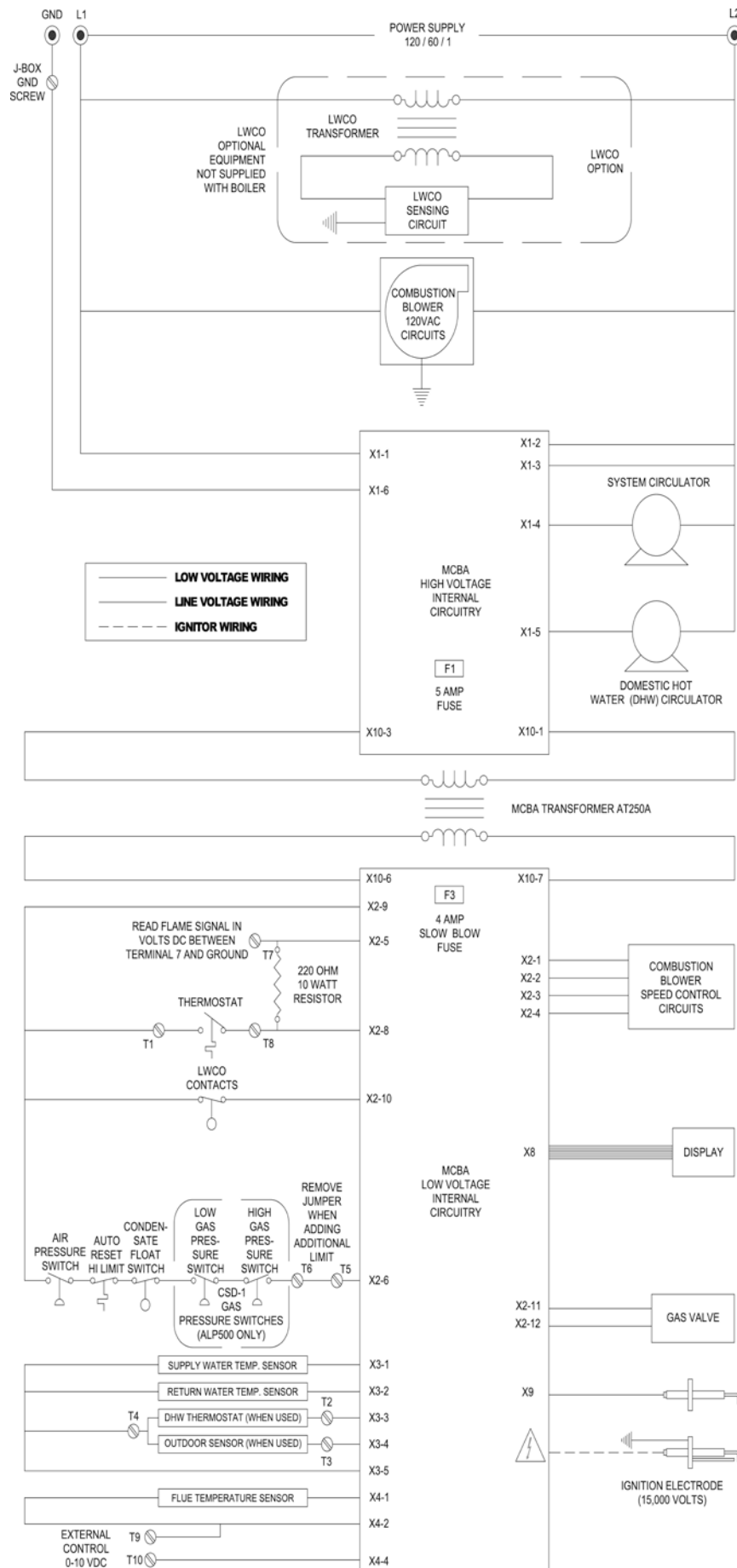
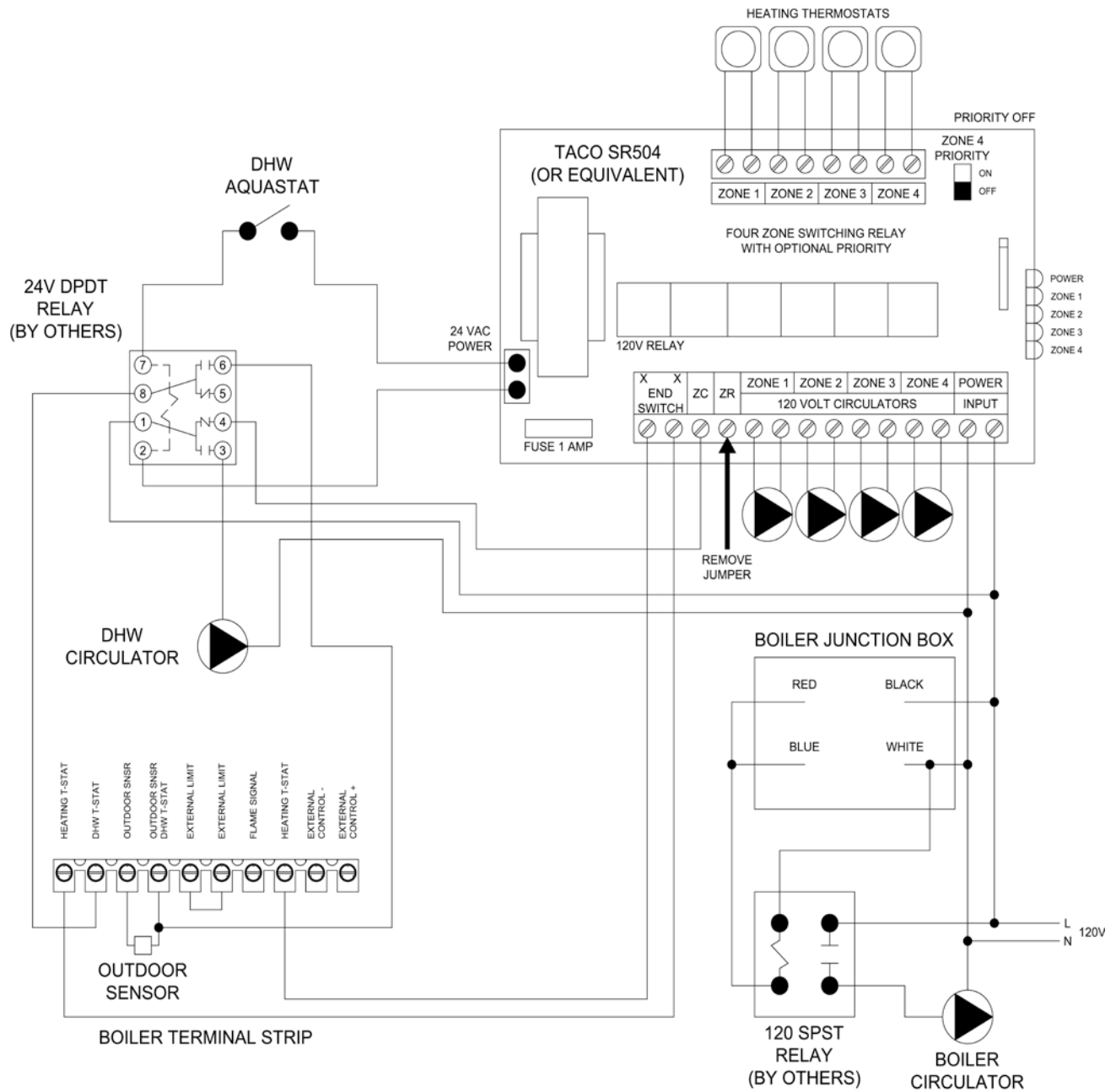


Figure 36: Ladder Diagram



***USE SAME POWER SOURCE FOR ALL CONTROLS AND
ENSURE POLARITY TO ALL CONTROL DEVICES IS CORRECT

Figure 37A: Modified Wiring For DHW Priority When Using Low Flow Circulator Piped Off System Header - Heating (with Central Heating Circulators) Plus Alternately Piped Indirect Water Heater

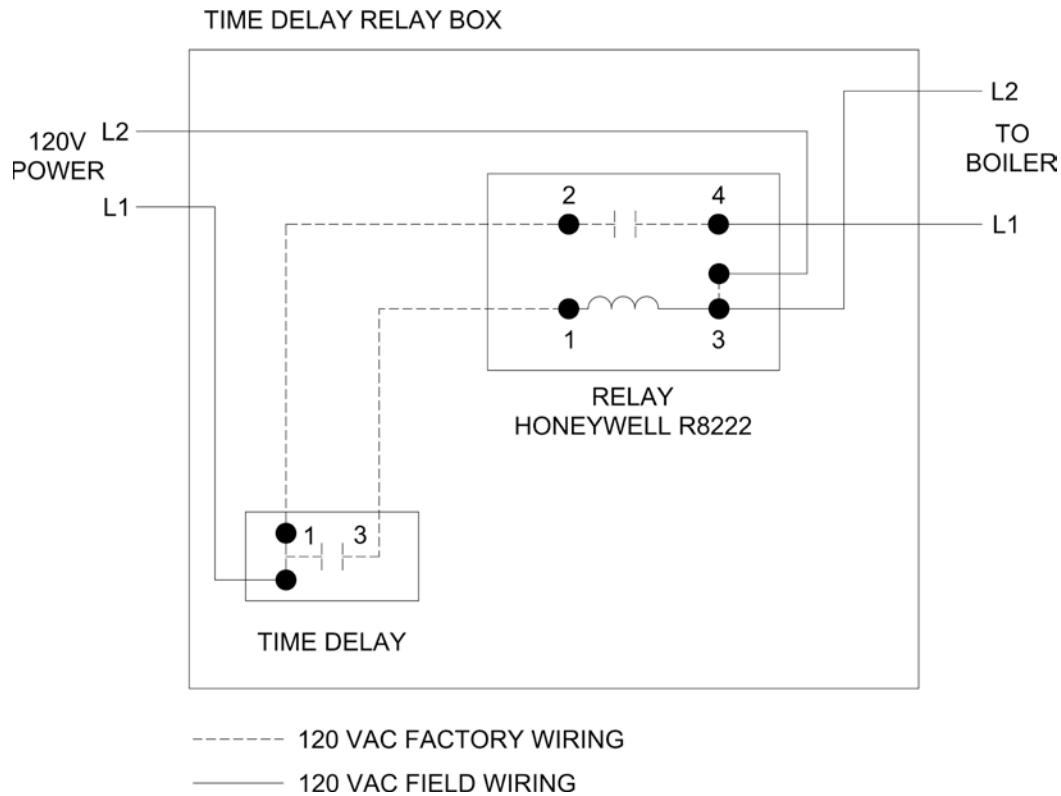


Figure 38: Wiring for MCBA Modulating Boiler Control Time Delay Relay Box

5. If the boiler installation site may be subject to low supply voltage conditions or “brownouts”, that would affect MCBA Modulating Boiler Control operation, a separate optional Time Delay Relay Box (P/N 101693-01) installation is strongly recommended. See Figure 38 “Wiring for MCBA Modulating Boiler Control Time Delay Relay Box” and follow the following installation steps:
 - a. Turn off power to boiler.
 - b. Remove 120 volt power wiring, L1, L2 and ground.
 - c. Remove cover to MCBA Time Delay Relay Box.
 - d. Mount MCBA Time Delay Relay Box on secure surface near boiler.
 - e. Connect wiring to MCBA Time Delay Relay Box as per wiring diagram (Figure 38).
 - f. Connect additional field wiring (not included in the kit) from MCBA Time Delay Relay Box to 120 volt power wiring as per wiring diagram (Figure 38).
 - g. Install cover on MCBA Time Delay Relay Box and restore power to boiler.
 - h. Measure time from when power is restored until the boiler actually powers up (LED numbers will reappear on MCBA display panel). This MCBA Time Delay Relay Box has a delay on make timer that delays powering of the boiler for 3 minutes whenever power is lost to the boiler. Timing should be approximately 3 minutes, but no longer than 4 minutes.
 - i. Cycle boiler per installation manual.

IX. Boiler Stacking

For installations with unusually high space heating and/or domestic hot water heating loads, where employing two (2) Alpine (ALP) boilers will offer the benefits of greater operational efficiency, floor space savings and boiler redundancy, the Alpine (ALP) boilers may be installed stacked one on the top of the other. Refer to Table 18 “Alpine (ALP) Boiler Model Stacking Combinations” for details.

Table 18: Alpine (ALP) Boiler Model Stacking Combinations

Bottom Boiler Model	Top Boiler Model
ALP080	ALP080
ALP105	ALP080
	ALP105
ALP150	ALP080
	ALP105
	ALP150
ALP210	ALP080
	ALP105
	ALP150
	ALP210
ALP285	ALP080
	ALP105
	ALP150
	ALP285
ALP399	ALP080
	ALP105
	ALP150
	ALP210
	ALP285
	ALP399

A. To field assemble individual Alpine (ALP) boilers into a stackable configuration, use the steps below:

1. Position the bottom boiler first. Refer to Sections II “Pre-Installation” and III “Unpacking Boiler” of the manual for details. **Always position higher input boiler model as bottom boiler.**
2. Each Alpine (ALP) boiler is factory packaged with two (2) Stacking Boiler Attachment Brackets (P/N 101679-01) and the bracket mounting hardware [six (6) self-drilling hex washer head plated #8 x 1/2” long screws, P/N 80860743]. Locate and remove the brackets and the hardware. The Stacking Boiler Attachments Bracket has three 7/32” diameter holes punched in a triangular pattern. See Figure 39 “Stacking Boiler Attachment Bracket Placement”.
3. Alpine (ALP) boiler left and right side panels have a series of dimples at panel top and bottom. These dimples are positioning dimples for Stacking Boiler Attachment Bracket mounting screws. Side panel

bottom positioning dimples are evenly spaced from boiler front and back, while side panel top positioning dimples follow specific pattern to compensate for Alpine (ALP) boiler model variable depth.

4. Position the upper boiler on the top of the bottom boiler and align boiler front doors and sides flush with each other.
 - Place first Stacking Boiler Attachment Bracket onto the upper boiler left side panel, at the panel lower left corner and align bracket two upper holes with corresponding side panel lower dimples.
 - The remaining lower bracket hole must align with a matching bottom boiler left side panel top positioning dimple.
 - Once bracket holes and side panel dimple alignment is verified, attach the bracket to top and bottom boiler left side panels with the mounting screws.
5. Repeat above procedure to install second Stacking Boiler Attachment Bracket and secure the stacked boiler right side panels together at the front right corner.
6. Install the third Stacking Boiler Attachment Bracket to secure top and bottom boiler left side panels at the rear left corner. Align the bracket holes with corresponding positioning dimples in the top boiler and bottom boiler left side panels, then secure bracket with the screws.
7. Repeat above procedure to install the forth Stacking Boiler Attachment Bracket to secure stacked boiler right side panels at the rear right corner.

B. When installing stackable boiler combinations

observe the following guidelines:

1. **Venting** - Top and bottom boilers must have their individual concentric vent piping and vent terminals.

WARNING

No common manifolded venting is permitted.

For side-wall venting individual model vent terminals must terminate not closer than 12 inches horizontally and three (3) feet vertically from each other in order to prevent combustion air contamination. For vertical through the roof venting, individual vertical vent terminals, if level with each other, must be spaced no closer than 12 inches horizontally. If vertical terminals cannot end in one plane, they must be spaced no closer than three (3) feet horizontally.

Chimney chase concentric venting is permitted for modules, when stackable, providing concentric

vertical (roof) vent terminals, if level with each other, are spaced no closer than 12 inches horizontally.

If vertical vent terminals cannot end in one plane, they must be spaced no closer than three (3) feet horizontally.

Follow instructions in Section IV “Venting” of the manual for specifics of individual boiler vent termination. Follow instructions in Section V for each individual boiler flue gas condensate line construction and condensate disposal. Terminating individual boiler condensate lines into common pipe prior to drain disposal is permissible, providing common pipe has sufficient flow capacity to handle combined condensate volume of stackable combination.

2. Gas Piping - Follow instructions in Section VII “Gas Piping” of the manual for sizing and installation

of an individual boiler. When common gas piping is sized, insure it will have **adequate capacity for combined input (GPH gas flow) of the selected stackable boiler combination.**

3. Water Piping and Trim - Follow instructions in Section VI “Water Piping and Trim” of the manual for system piping and boiler secondary piping selection/sizing based on **combined heating capacity and/or gross output of the selected stackable boiler combination.** Follow instructions of Section VI for each individual boiler trim installation.
4. Electrical - Follow instructions in Section VIII “Electrical” of the manual to wire individual boilers. Stackable boilers require a separate, installer provided, staging control (Tekmar Model 265 or equivalent) to operate the boilers. Follow control manufacturer instructions to wire it to the boilers.

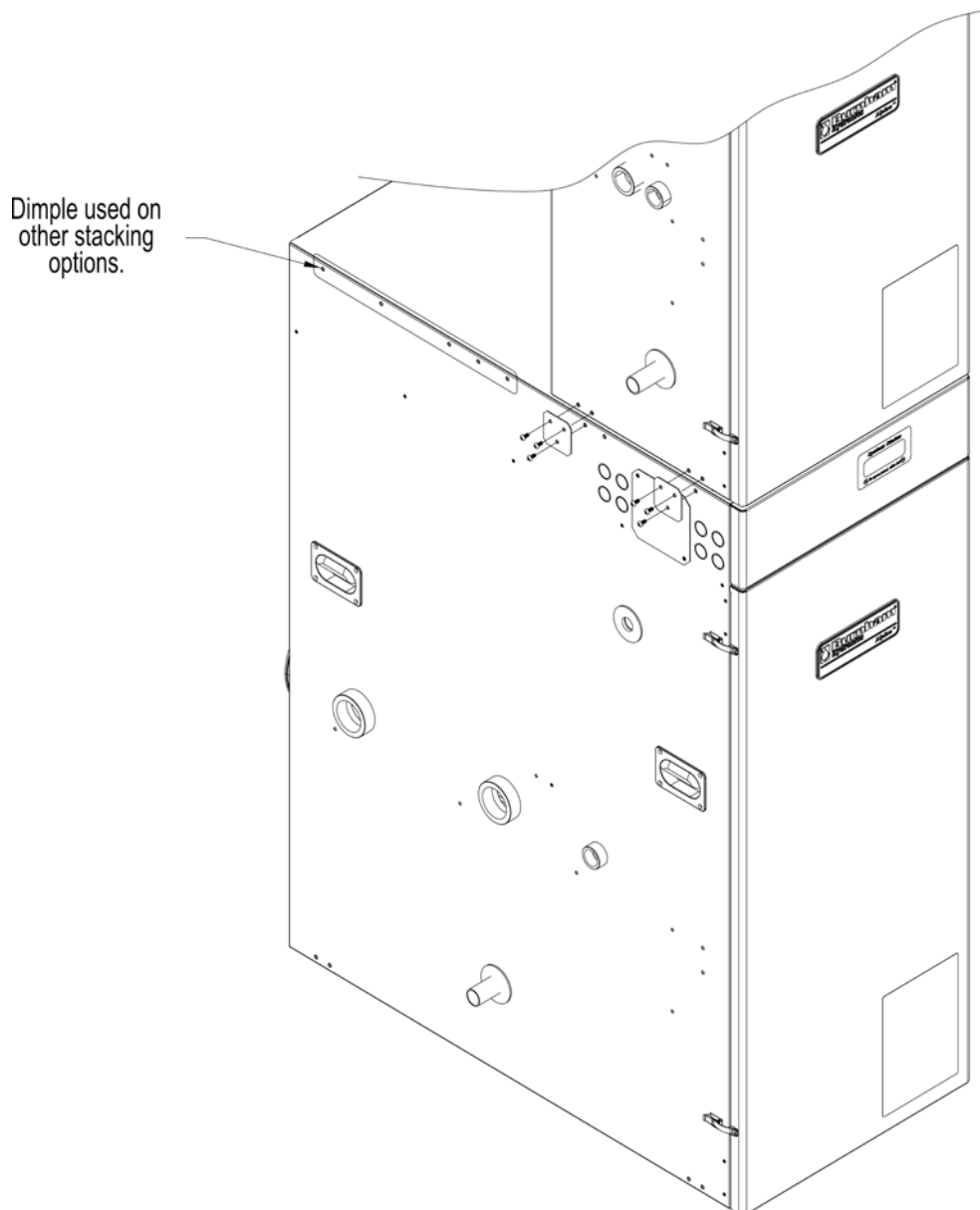


Figure 39: Stacking Boiler Attachment Bracket Placement

X. Modular Installation

A. General Guidelines

1. Read and follow all venting, combustion air, water piping, gas piping and electrical instructions contained in the Installation, Operating and Service Instructions unless otherwise instructed in this section.
2. Consult Local Building Codes or National Fuel Gas Code, NFPA 54/ANSI Z222.3 for restrictions and instructions on modular boiler installations.

B. Modular Boiler Venting System Arrangements

Using CPVC/PVC pipe for Individual Module Vent Piping – (See Figure 40)

1. Each individual module (boiler) must have own vent pipe and vent terminal. Refer to Section IV “Venting” of these Instructions for individual module (boiler) venting guidelines and options.

WARNING

No common manifolded venting (vent piping and vent terminals) is permitted.

2. The individual module (boiler) maximum vent length is sixty (60) equivalent feet.
3. For side wall venting the minimum horizontal distance between any adjacent individual module (boiler) vent terminations is twelve (12) inches. Additional horizontal spacing between any adjacent individual module (boiler) vent terminations as well as extending the distance from building surfaces to vent termination end are recommended to avoid frost damage to building surfaces where vent terminations are placed.

CAUTION

Installing multiple individual module (boiler) vent terminations too close together may result in combustion product water vapor condensation on building surfaces, where vent termination are placed, and subsequent frost damage. To avoid/minimize frost damage, extend the distance from building surfaces to vent termination end and increase the horizontal distance between adjacent vent terminations.

4. Individual module (boiler) sidewall vent terminals must be placed at least twelve (12) inches above the ground plus the expected snow accumulation.
5. Multiple individual module vertical vent pipes may be piped through a common conduit or chase so that one roof penetration may be made. The minimum horizontal distance between any adjacent individual module (boiler) roof vent terminations is one (1) foot.

Using PVC Pipe for Individual Module Combustion Air Intake Piping – (See Figure 40)

1. Each individual module (boiler) must have own combustion air intake pipe and combustion air intake terminal. Refer to Section IV “Venting” of these Instructions for individual module (boiler) combustion air intake guidelines and options.
2. The individual module (boiler) maximum combustion air intake pipe length is sixty (60) equivalent feet.
3. If possible, locate each individual module (boiler) both combustion air intake termination and vent termination on the same side wall, to prevent nuisance boiler shutdowns. However, if same side wall placement is problematic, an individual module (boiler) may be installed using vertical venting and side wall combustion air intake termination (or, vice versa)

Using Concentric Combination Venting/Combustion Air Intake Piping - Inner Polypropylene Vent Pipe/Outer Combustion Air Intake Steel Pipe Casing – (See Figure 40)

1. Each individual module (boiler) must have own concentric vent pipe and vent termination. Follow Section IV “Venting” of these Instructions for individual module (boiler) concentric venting guidelines.

WARNING

No common manifolded concentric venting is permitted.

2. The individual module (boiler) maximum concentric vent length is sixty (60) equivalent feet.
3. For sidewall venting any adjacent individual module (boiler) concentric vent terminals must be spaced no closer than 12 inches horizontally and three (3) feet vertically from each other to prevent combustion air contamination. Additional horizontal spacing between any adjacent individual module (boiler) concentric vent terminations and increased distance from building surfaces to concentric vent termination end are recommended to avoid frost damage to building surfaces where vent terminations are placed.
4. Individual module (boiler) sidewall concentric vent terminals must be placed at least twelve (12) inches above the ground plus the expected snow accumulation.
5. For vertical through the roof venting any adjacent individual module (boiler) vertical vent terminals, if level with each other, must be spaced no closer than 12 inches horizontally.

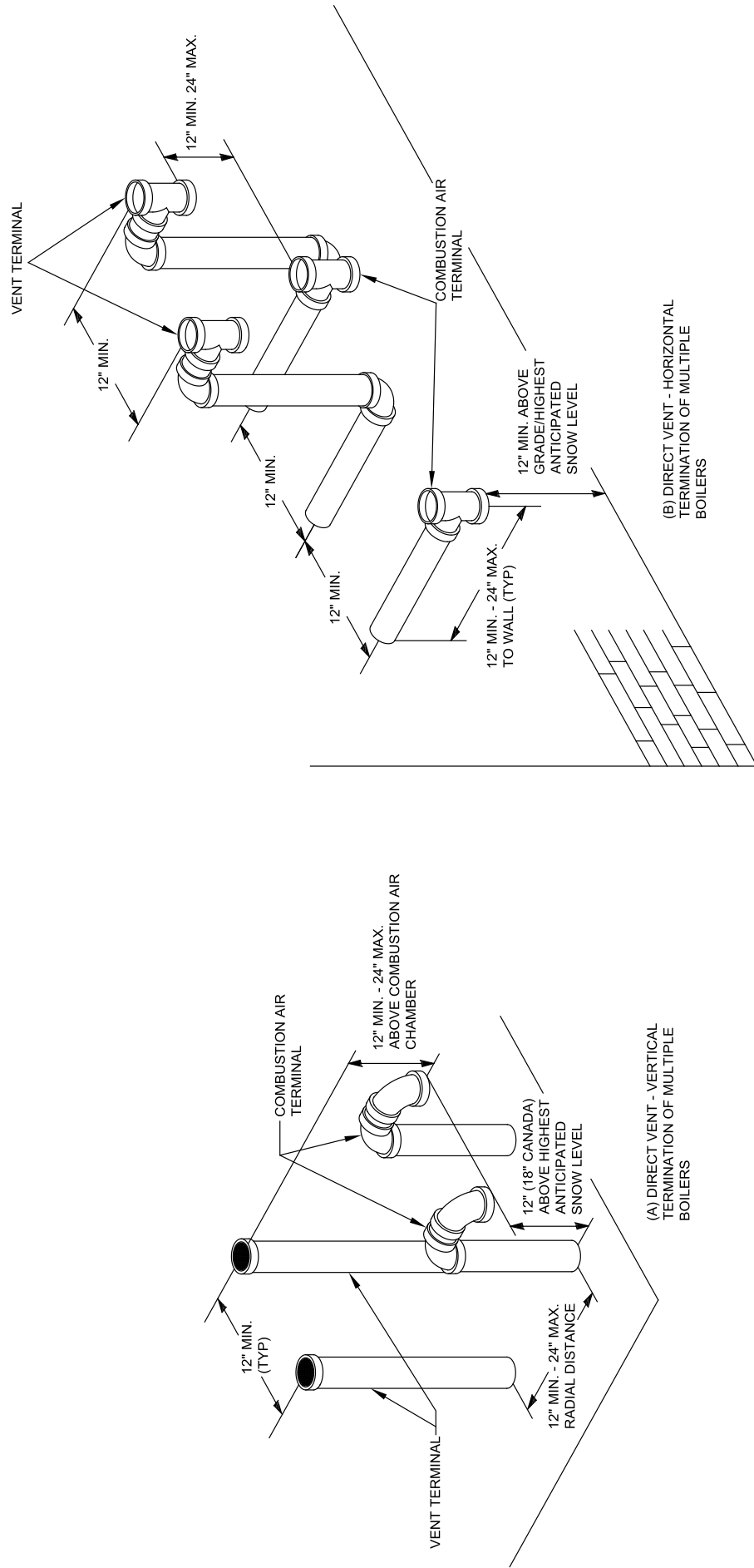
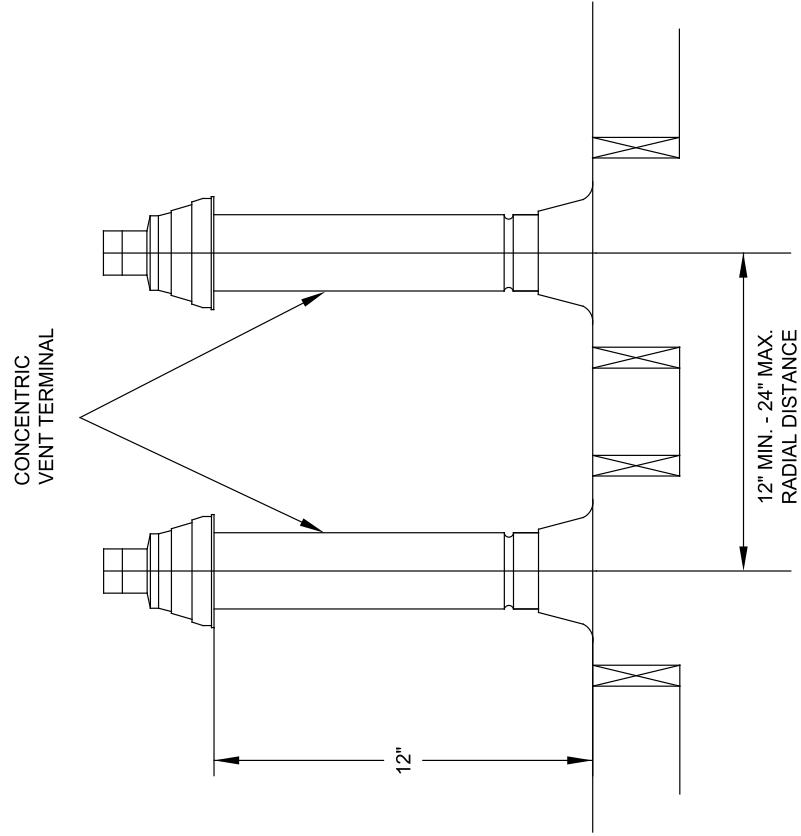
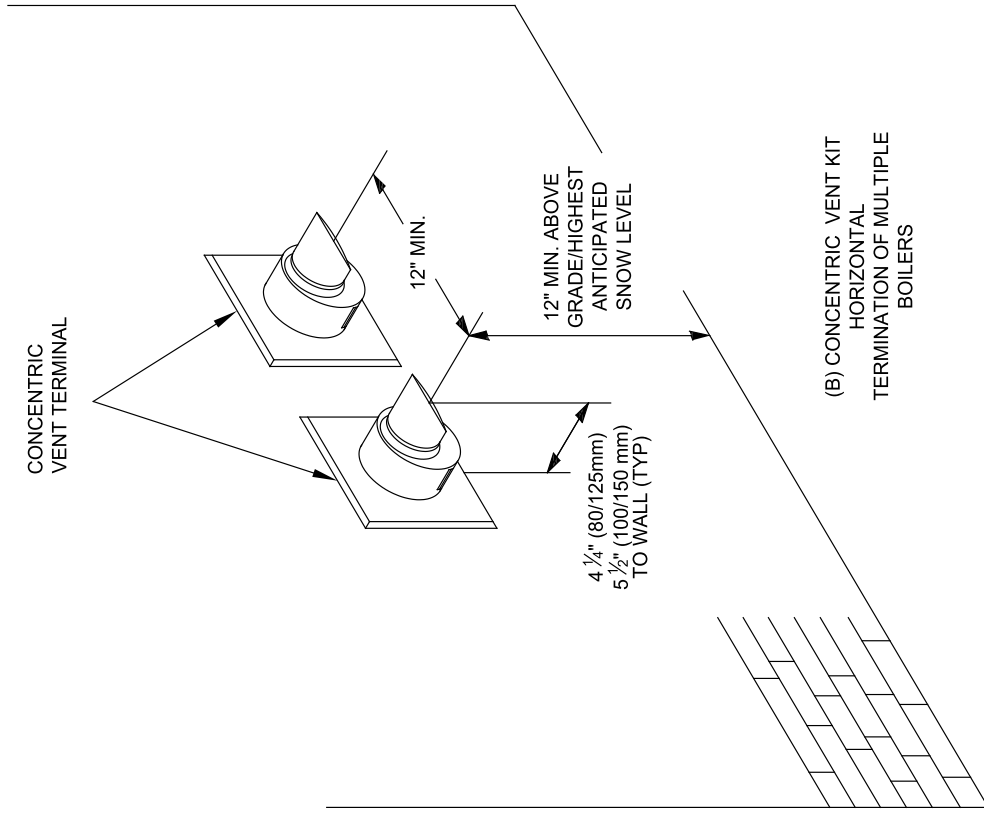


Figure 40: Modular Boiler Direct Vent Termination



(A) CONCENTRIC VENT KIT
VERTICAL
TERMINATION OF MULTIPLE
BOILERS

Figure 41: Modular Boiler Concentric Vent Termination

If vertical vent terminals cannot end in one plane, they must be spaced no closer than three (3) feet horizontally.

6. Chimney chase concentric venting is permitted for modules, when stackable, providing concentric vertical (roof) vent terminals, if level with each other, are spaced no closer than 12 inches horizontally.

If vertical vent terminals cannot end in one plane, they must be spaced no closer than three (3) feet horizontally.

7. When individual modules (boilers) are installed in the same horizontal plane, chimney chase vertical concentric venting is permitted provided:
 - a. Sufficient inside space available at the base of the chimney to install multiple chimney chase brackets and support elbows.
 - b. Spacing between adjacent vertical vent terminals is in accordance with paragraph 6 above.

CAUTION

Installing multiple individual module (boiler) concentric vent terminations too close together may result in combustion product water vapor condensation on building surfaces, where termination are placed, and subsequent frost damage. To avoid/minimize frost damage extend the distance from building surfaces to concentric vent termination end as well as increase the horizontal distance between adjacent concentric vent terminations.

C. Modular Boiler Water Piping – (See Table 19 and Figure 42)

Refer to Section VI “Water Piping and Trim” of these Instructions for:

1. Installation of Factory Supplied Piping and Trim Components for an individual module (boiler).
2. Regarding an individual module (boiler) piping system specific details.
3. Selection criteria for individual module (boiler) space heating and/or DHW circulators.

D. Modular Boiler Gas Piping

1. Individual module (boiler) gas pipe sizing specific details
2. Individual module (boiler) recommended gas piping. See Figure 34.
3. Requirement to install additional gas pressure regulators to properly regulate gas pressure at the input of the smallest individual module (boiler).

WARNING

If gas pressure in the building is above ½ psig, an additional gas pressure regulator is required. Using one additional regulator for multiple boilers may result in unsafe boiler operation. The additional regulator must be able to properly regulate gas pressure at the input of the smallest boiler. If the regulator cannot do this, two or more additional regulators are required. Consult regulator manufacturer and/or local gas supplier for instructions and equipment ratings.

E. Modular Boiler Electrical

Refer to Section VIII “Electrical” of these Instructions for:

1. Individual module (boiler) wiring specific details
2. Individual module (boiler) internal wiring details, high and low voltage connections

Each individual module (boiler) must be provided with own fused disconnect and own service switch.

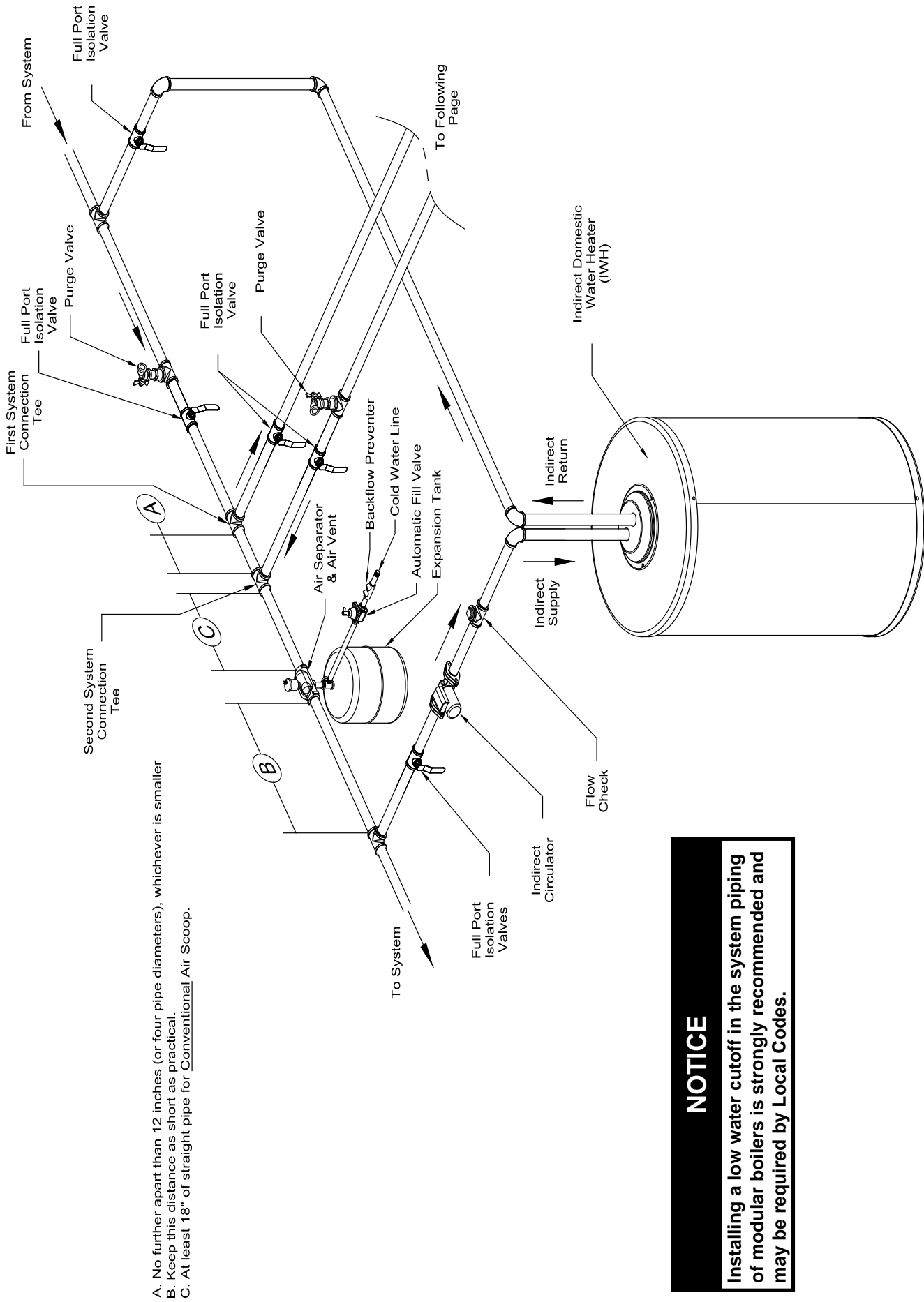
Install modular boiler wiring in accordance with requirements of authority having jurisdiction. In absence of such requirements, follow the National Electric Code, NFPA 70 and/or CSAC 22.1 Electric Code.

F. Modular Boiler Control Systems – (See Figures 44 and 45)

1. Follow modular boiler control system manufacturer (Honeywell, Tekmar etc.) instructions to properly apply a modular control system.
2. Tekmar model 264 and model 265 based control wiring diagrams (Figures 44 and 45) are provided as examples of typical modular boiler control system.
3. Additionally, common modular boiler control systems may use outdoor temperature sensing, return water temperature sensing or both to stage modular boilers.

Table 19: Modular Boiler Water Manifold Sizing

Boiler Model	Number of Units						
	2	3	4	5	6	7	8
	Recommended Minimum Common Water Manifold Size (NPT)						
ALP080	1¼"	1½"	2"	2½"	2½"	2½"	2½"
ALP105	1½"	2"	2"	2½"	2½"	2½"	3"
ALP150	2"	2"	2½"	2½"	2½"	3"	3½"
ALP210	2"	2½"	3"	3"	3½"	4"	4"
ALP285	2½"	2½"	3"	3½"	3½"	4"	5"
ALP399	2½"	3"	3"	4"	4"	5"	5"



NOTICE

Installing a low water cutoff in the system piping of modular boilers is strongly recommended and may be required by Local Codes.

Figure 42: Modular Boiler Water Piping w/Domestic Hot Water Heater

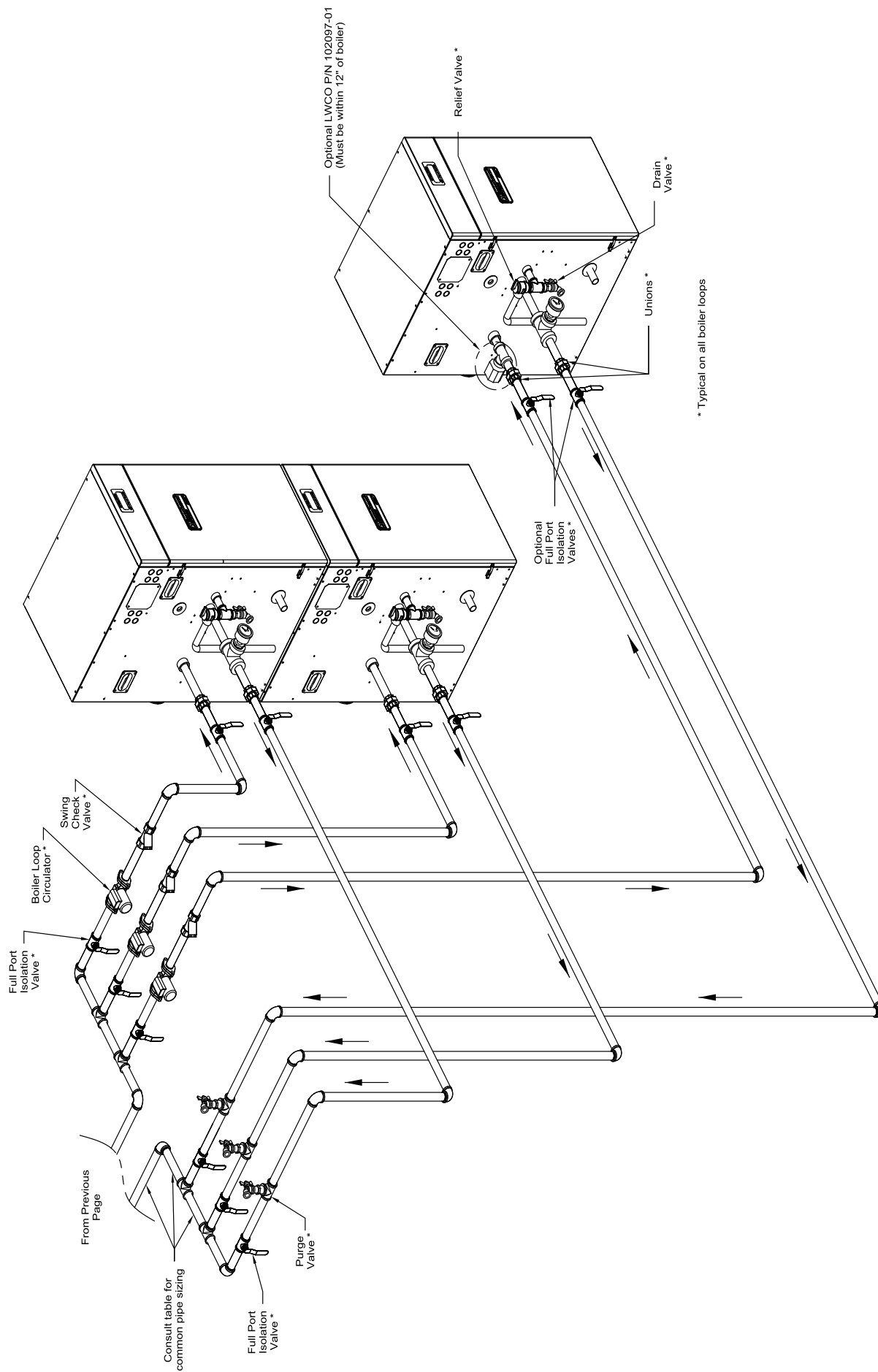
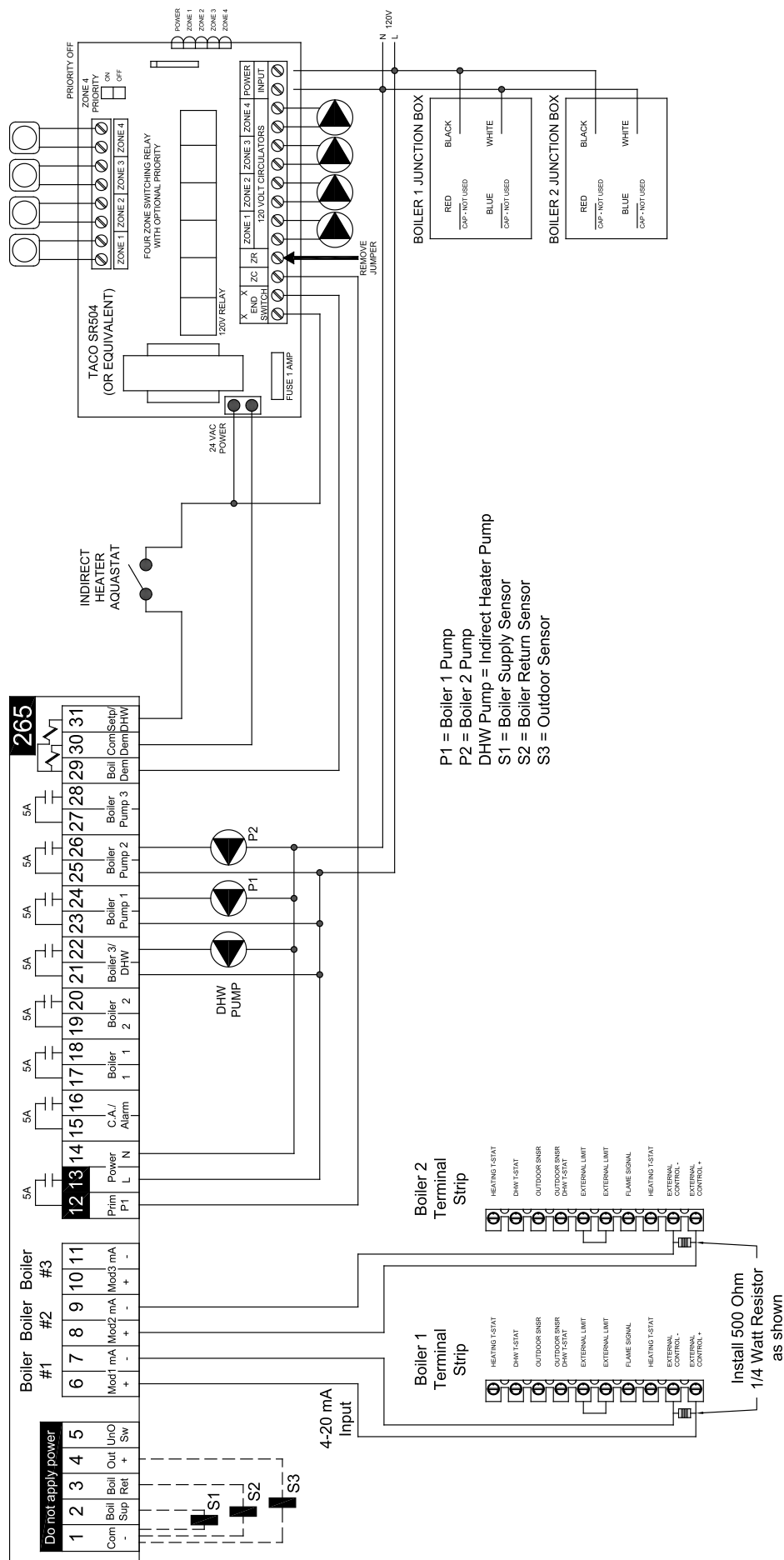


Figure 43: Modular Boiler Water Piping w/Domestic Hot Water Heater (Continued)



**Figure 44: Modular Wiring Diagram w/Tekmar 265 Control
Tekmar 265 Based Control System (or equal)
Sequence of Operation**

The Tekmar 265 Control (or equal) can control either 3 modulating boilers or 2 modulating boilers and an Indirect Water Heater. When a call for heat is received by the Tekmar 265 Control, the control will fire either one or more boilers in either parallel or sequential firing mode to establish a required reset water temperature in the system supply main based on outdoor temperature. The boilers will modulate based on an Analog communication signal established between the Tekmar 265 Control and each boiler's MCBA Control. This signal is established by means of a pair of wires from boiler terminal strip to 265 Control utilizing a 500 OHM 1/4 watt resistor bridging the conductor connections (the resistors are installer provided and available at any electronic parts store like Radio Shack, etc.). The boiler(s) and system supply water temperature will be reset together to maintain what is needed to the system. When a call for Indirect Hot Water is generated to the Tekmar 265, the control will de-energize the zone pump control (ZC terminal), energize the Indirect pump and modulate the boiler firing to establish a setpoint temperature in the main for the Indirect Heater using Priority. The Tekmar 265 also controls each boiler's pump and a post purge of leftover temperature in the boilers will occur at the end of the call for Indirect Hot Water.

XI. System Start-up

- A. **Verify** that the venting, water piping, gas piping and electrical system are installed properly. Refer to installation instructions contained in this manual.
- B. **Confirm** all electrical, water and gas supplies are turned off at the source and that vent is clear of obstructions.
- C. **Confirm** that all manual shut-off gas valves between the boiler and gas source are closed.

WARNING

Completely read, understand and follow all instructions in this manual before attempting start up.

- D. **If not already done**, flush the system to remove sediment, flux and traces of boiler additives. **This must be done with the boiler isolated from the system.** Fill entire heating system with water meeting the following requirements:

NOTICE

pH between 8.2 and 9.5.

If system contains aluminum components, pH must be less than 8.5

Total Dissolved Solids - less than 2500 PPM

Hardness - 3 to 9 grains/gallon.

Pressurize the system to at least 12 PSI. Purge air from the system.

WARNING

The maximum operating pressure of this boiler is 30 psig. Never exceed this pressure. Do not plug or change pressure relief valve.

- E. **Confirm** that the boiler and system have no water leaks.
- F. **Prepare to check operation.**
1. Obtain gas heating value (in Btu per cubic foot) from gas supplier.
 2. Alpine gas valves have inlet and outlet pressure taps with built-in shut off screw. Turn each screw from fully closed position three to four turns counterclockwise to open taps. Connect manometers to pressure taps on gas valve.

NOTICE

If it is required to perform a long term pressure test of the hydronic system, the boiler should first be isolated to avoid a pressure loss due to the escape of air trapped in the boiler.

To perform a long term pressure test including the boiler, ALL trapped air must first be removed from the boiler.

A loss of pressure during such a test, with no visible water leakage, is an indication that the boiler contained trapped air.

3. Temporarily turn off all other gas-fired appliances.
4. Turn on gas supply to the boiler gas piping.
5. Open the field installed manual gas shut-off valve located upstream of the gas valve on the boiler.
6. Confirm that the supply pressure to the gas valve is 14 in. w.c. or less. Refer to Table 21 for minimum supply pressure.
7. Using soap solution, or similar non-combustible solution, electronic leak detector or other approved method. Check that boiler gas piping valves, and all other components are leak free. Eliminate any leaks.

DANGER

Do not use matches, candles, open flames or other ignition source to check for leaks.

8. Purge gas line of air.

G. Operating Instructions

Start the boiler using the lighting instructions, see Figure 46. After the boiler is powered up, it should go through the following sequence.

<u>Sequence</u>	<u>Display</u>	<u>Meaning</u>
1	<i>U.125</i> or Blank	Checking internal software (power-up only)
2	<i>0.5'W'T</i>	Boiler in standby. <i>5'W'T</i> = Supply Water Temp. No call for heat. (After call for heat from heating thermostat)
3	<i>R.5'W'T</i>	Self-Check on Start-up
4	<i>5.5'W'T</i>	Blower and circulator on. Checking for adequate air flow.
5	<i>1.5'W'T</i>	Prepurge
6	<i>2.5'W'T</i>	Trial for ignition
7	<i>3.5'W'T</i>	Flame established. Boiler responding to a call for heat.

Alpine™ Series Lighting and Operating Instructions

FOR YOUR SAFETY READ BEFORE OPERATING/POUR VOTRE SÉCURITÉ LISEZ AVANT DE METTRE EN MARCHÉ

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

AVERTISSEMENT: Quiconque ne respecte pas à la lettre les instructions dans la présente notice risque de déclencher un incendie ou une explosion entraînant des dommages, des blessures ou la mort.

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS:

- Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

- A. Cet appareil ne comporte pas de veilleuse. Il est muni d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.

- B. AVANT DE FAIRE FONCTIONNER, reniflez tout autour de l'appareil pour détecter une odeur de gaz. Reniflez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareil.
 - Ne touchez à aucun interrupteur ; ne pas vous servir des téléphones se trouvant dans le bâtiment.
 - Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
 - Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.
- C. Ne poussez ou tournez la manette d'admission du gaz qu'à la main ; ne jamais utiliser d'outil. Si la manette reste coincée, ne pas tenter de la réparer ; appelez un technicien qualifié. Le fait de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.
- D. N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

OPERATING INSTRUCTIONS/INSTRUCTIONS DE FONCTIONNEMENT

1. STOP! Read safety information above (to the left) on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Turn the external boiler manual gas valve handle clockwise ↻ to close the gas supply.
6. Wait five (5) minutes** to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above (to the left) on this label. If you don't smell gas, go to the next step.
7. Turn the external boiler manual gas valve handle counterclockwise ↺ to open the gas supply.
8. Turn on all electric power to the appliance.
9. Set the thermostat to the desired setting.
10. Look at the control display panel, the first digit will show a series of numbers that indicate the boiler control sequence. A number (3) or (4) means that the burner is firing. The number (0) indicates that there is no call for heat from the thermostat or the domestic water heater.
11. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

OPEN/OUVERT

CLOSED/FERMÉ



EXTERNAL BOILER
MANUAL GAS VALVE
LA CHAUDIÈRE EXTERNE
MANUELLE DE CLAPET À GAZ

1. ARRÊTEZ ! Lisez les instructions de sécurité sur la portion supérieure (à gauche) cette étiquette.
2. Réglez le thermostat à la température la plus basse.
3. Coupez l'alimentation électrique de l'appareil.
4. Cet appareil est équipé de l' dispositif d'allumage qui allume automatiquement le brûleur. Ne pas essayer d'allumer le brûleur à la main.
5. Tourner la chaudière externe manuelle poignée ↻ en clapet à gaz dans le sens des aiguilles d'une montre pour fermer l'offre de gaz.
6. Attendre cinq (5) minutes** pour laisser échapper tout le gaz. Reniflez tout autour de l'appareil, y compris près du plancher, pour détecter une odeur de gaz, ARRÊTEZ ! Passez à l'étape B des instructions de sécurité sur la portion supérieure (à gauche) cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
7. Tourner la chaudière externe manuelle poignée ↺ en clapet à gaz ouvrir dans le sens des aiguilles d'une montre le gaz approvisionnement.
8. Allumer toute l'énergie électrique au appareil.
9. Réglez le thermostat à la température désirée.
10. Regarder le panneau affichage commande, le premier chiffre montrera une série de nombres qui indiquent la chaudière ordre d'exécution des instructions. Un nombre (3) ou (4) signifie que le brûleur est mise à feu. Le nombre (0) indique ce là n'est aucun appel pour la chaleur de le thermostat ou le domestique chauffe-eau.
11. Si l'appareil ne se met pas en marche, suivez les instructions intitulées « Comment couper l'admission de gaz de l'appareil » et appelez un technicien qualifié ou le fournisseur de gaz.

TO TURN OFF GAS TO APPLIANCE/COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn the external boiler manual gas valve handle clockwise ↻ to close gas supply.

1. Réglez le thermostat à la température la plus basse.
2. Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
3. Tourner la chaudière externe manuelle poignée ↻ en clapet à gaz dans le sens des aiguilles d'une montre pour fermer l'offre de gaz.

Figure 46: Lighting Instructions

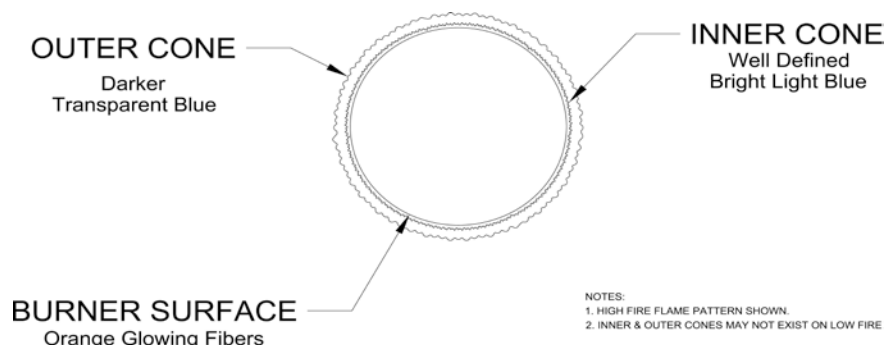


Figure 47: Burner Flame

H. Purge Air From Gas Train

Upon initial start-up, the gas train will be filled with air. Even if the gas line has been completely purged of air, it may take several tries for ignition before a flame is established. If more than 5 tries for ignition are needed, it will be necessary to press the reset button to restart the boiler. Once a flame has been established for the first time, subsequent calls for burner operation should result in a flame on the first try.

I. Check Burner Flame

Inspect the flame visible through the window. On high fire the flame should be stable and mostly blue (Figure 47). No yellow tipping should be present; however, intermittent flecks of yellow and orange in the flame are normal.

J. Check Gas Inlet Pressure

Check the inlet pressure and adjust if necessary. Verify that the inlet pressure is between the upper and lower limits shown on the rating plate with all gas appliances on and off.

WARNING

The outlet pressure for the gas valve has been factory set and requires no field adjustment. This setting is satisfactory for both natural gas and propane. Attempting to adjust the outlet pressure may result in damage to the gas valve and cause property damage, personal injury or loss of life.

Table 20: Recommended Combustion Settings, Natural Gas

Boiler Model	Altitude Range		
	0 - 7000 Ft.		
	% CO ₂	% O ₂ Range	CO, PPM
ALP080	8.2 - 8.8	5.5 - 6.5	Less than 75 PPM
ALP105			
ALP150			
ALP210			
ALP285			
ALP399			

K. Perform Combustion Test

Perform a combustion test. Boilers equipped with a concentric vent system have a flue gas sample tap located in the boiler vent collar (under the screw cap). Insert the analyzer probe in the flue gas sample tap. Check CO₂ (or O₂) and CO at both high and low fire. The boiler may be temporarily locked into high or low fire for 15 minutes as follows:

1. To lock the boiler in high fire, simultaneously press and hold the "Mode" button and "+" button until the display flashes "H", indicating that the boiler has been driven to high fire. After this happens, allow the boiler to operate for approximately 5 minutes before taking combustion readings.
2. To lock the boiler in low fire, simultaneously press and hold the "Mode" button and "-" button until the display flashes "L", indicating that the boiler has been driven to low fire. After this happens, allow the boiler to operate for approximately 5 minutes before taking combustion readings.
3. Normal modulation of the boiler should return 15 minutes after the boiler is locked in high or low fire. Typical CO₂ readings are shown in Table 20.

WARNING

Each Alpine Series boiler is tested at the factory and adjustments to the air fuel mixture are normally not necessary. Consult a U.S. Boiler representative before attempting to make any such adjustments. Improper gas valve or mixture adjustments could result in property damage, personal injury, or loss of life.

L. Test External Limits

Test any external limits or other controls in accordance with the manufacturer's instructions.

M. Check Thermostat Operation

Verify that the boiler starts and stops in response to calls for heat from the heating thermostat and indirect water heater thermostat. Make sure that the appropriate circulators also start and stop in response to the thermostats.

N. Adjust Supply Water Temperature

As shipped, the heating and indirect water heater set point supply temperatures are both set to 180°F. If necessary, adjust these to the appropriate settings for the type of system to which this boiler is connected. See Section XII “Operation” of this manual for information on how to do this.

O. Adjust Thermostats

Adjust the heating and indirect water heater thermostats to their final set points.

P. Field Conversion From Natural Gas to LP Gas

Alpine Series boilers are factory shipped as Natural Gas builds. Follow steps below for field conversion from Natural Gas to LP Gas.

WARNING

This conversion should be performed by a qualified service agency in accordance with the manufacturer's instructions and all applicable codes and requirements of the authority having jurisdiction. If the information in these instructions is not followed exactly, a fire, an explosion or production of carbon monoxide may result causing property damage, personal injury, or loss of life. The qualified service agency is responsible for proper conversion of these boilers. The conversion is not proper and complete until the operation of the converted appliance is checked as specified in the Alpine™ Installation, Operating and Service Instructions.

WARNING

These instructions include a procedure for adjusting the air-fuel mixture on this boiler. This procedure requires a combustion analyzer to measure the CO₂ (or Oxygen) and Carbon Monoxide (CO) levels in flue gas. Adjusting the air-fuel mixture without a proper combustion analyzer could result in unreliable boiler operation, personal injury, or death due to carbon monoxide poisoning.

1. Make sure that the planned fuel conversion is listed in Table 21. If the planned conversion is not shown in Table 21, it is not permitted. Refer to Figure 34 to identify the valve used on the model being converted.
2. Conversion of Alpine Series boilers from one fuel to another is accomplished using the throttle screw on the gas valve. Figure 48 shows the location of the throttle screw on the Dungs valve. Locate the throttle on the boiler being converted.

Table 21: Permitted Conversions

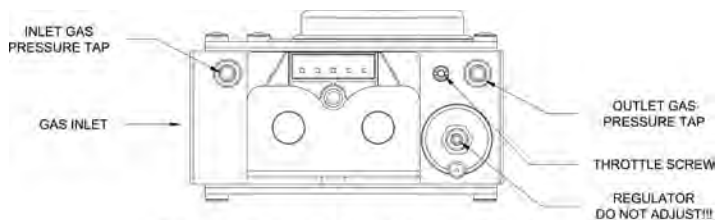
Boiler Model	Gas Valve Size (NPT)	(Dungs) Gas Valve Model	Fuel Converted		Planned Installation Altitude Range
			From	To	
ALP080	1/2"	GB-WND 055 D01 S00 253082	Natural Gas	LP	0 - 7,000 Ft.
ALP105		GB-WND 055 D01 S00 253083			
ALP150		GB-WND 055 D01 S00 253084			
ALP210	3/4"	GB-WND 057 D01 S00 253085			
ALP285		GB-WND 057 D01 S00 253086			
ALP399		GB-WND 057 D01 S00 253086			

3. If conversion is being made on a new installation, install the boiler in accordance with the installation instructions supplied with the boiler. If an installed boiler is being converted, connect the new gas supply to the boiler, check for gas leaks, and purge the gas line up to the boiler in accordance with the National Fuel Gas Code (ANSI Z223.1) or the requirements of the authority having jurisdiction.
4. Before attempting to start the boiler, make the number of turns to the throttle screw called for in Table 22.

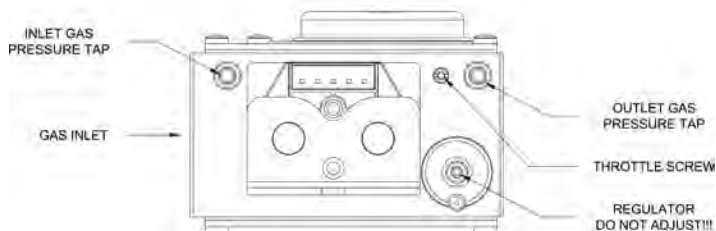
Table 22: Number of Clockwise Throttle Screw Turns

Boiler Model	Gas Valve	Throttle Screw Turns at Altitude Range
		0 - 7000 Ft.
ALP080	Dungs GB-055 (½" NPT)	2¾
ALP105		4
ALP150		3¾
ALP210		4
ALP285	Dungs GB-057 (¾" NPT)	4½
ALP399	Dungs GB-057 HO (¾" NPT)	1¾

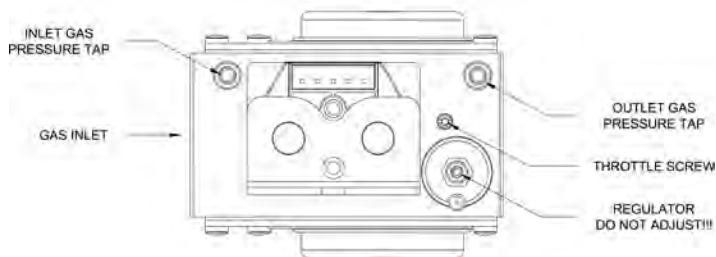
5. Attempt to start the boiler using the lighting instructions located inside the lower front cover of the boiler. If the boiler does not light on the first try for ignition, allow to boiler to make at least four more attempts to light. If boiler still does not light, turn the throttle counter clockwise in 1/4 turn increments, allowing the boiler to make at least three tries for ignition at each setting, until the boiler lights.



GB-WND 055 (1/2"NPT) - ALP080, ALP105, ALP150, ALP210



GB-WND 057 (3/4"NPT) - ALP285



GB-WND 057 XP (3/4"NPT) - ALP399

Figure 48: Dungs Gas Valve Detail

6. After the burner lights, force the burner to high fire by simultaneously pressing and holding the "Mode" button and "+" button. After a few seconds, the display should flash "H", indicating that the boiler has been driven to high fire. Allow the boiler to operate for approximately 5 minutes before taking combustion readings. Note: after 15 minutes, the boiler is automatically released from high fire hold. Be sure to restore high fire hold if additional time is needed to obtain high fire combustion readings.

7. Perform a combustion test. Boilers equipped with a concentric vent system have a flue gas sample tap located in the boiler vent collar (under the screw cap).
8. While the burner is at high fire adjust the throttle as needed to obtain the CO₂ (or O₂) settings shown in the Table 23:
 - To reduce the CO₂ (increase the O₂) turn the throttle clockwise
 - To increase the CO₂ (reduce the O₂) turn the throttle counter-clockwise

Make adjustments in increments of 1/8 to 1/4 turn and allow the boiler at least a minute to respond to each adjustment before making another. In general, the CO level will be at its lowest somewhere in the CO₂ range shown in this table.

Table 23: Recommended Combustion Settings, LP Gas

Boiler Model	Altitude Range		
	0 - 7000 Ft.		
	% CO ₂	% O ₂ Range	CO, PPM
ALP080	9.5 - 10.1	5.5 - 6.5	Less than 75 PPM
ALP105			
ALP150			
ALP210			
ALP285			
ALP399			

9. Verify that the gas inlet pressure is between the upper and lower limits shown in Table 24 with all gas appliances (including the converted boiler) both on and off:
10. A label sheet is provided with the boiler for conversions from natural to LP gas. Once conversion is completed, apply labels as follows:
 - Apply the "Rating Plate Label" adjacent to the rating plate.
 - Apply the "Gas Valve Label" to a conspicuous area on the gas valve.

WARNING

The pressure regulator has been factory set using precision instruments and must never be adjusted in the field. The gas valve outlet pressure is the same for both natural gas and propane. Make sure that all adjustments are made with the throttle, not the pressure regulator. Attempting to adjust the pressure regulator will result in damage to the gas valve and may cause property damage, personal injury or loss of life.

WARNING

The throttle adjustments shown in Table 22 are approximate. The final throttle setting must be found using a combustion analyzer. Leaving the boiler in operation with a CO level in excess of the value shown in Table 23 could result in injury or death from carbon monoxide poisoning.

NOTICE

If the throttle is very far out of adjustment on the “rich” (counter-clockwise) side, the boiler burner may be running at 0% Excess Air or even with air deficiency.

At 0% Excess Air the CO₂ readings will be either 11.9% CO₂ for Natural Gas or 13.8% CO₂ for LP Gas (O₂ will be 0%) and CO level will be extremely high (well over 1000 PPM).

If the burner operates with air deficiency, the following phenomena may be observed:

% CO₂ will actually drop (% O₂ will increase) as the throttle is turned counterclockwise

% CO₂ will actually increase (% O₂ will drop) as the throttle is turned clockwise

If the boiler appears to operate with air deficiency, turn the throttle clockwise to increase the amount of Excess Air to the burner.

As the throttle is turned clockwise, the CO₂ level will rise, eventually peaking @ 11.8% or 13.8%, depending of the type of gas being used, before falling (conversely, O₂ level will drop to 0% before rising). After this happens, continue turning the throttle clockwise, until CO₂ level drops (or O₂ level increases) to the values shown in Table 20 or Table 23.

Table 24: Inlet Pressure Limits

Fuel	Inlet Pressure (Inches w.c.)	
	Min.	Max.
Natural Gas	4.0	14.0
LP	11.0	14.0

- Apply the “Boiler Conversion Label” to a conspicuous surface on, or adjacent to, the outer boiler jacket. Fill in the date of the conversion and the name and address of the company making the conversion with a permanent marker.

11. Refer to Section XI “System Start-up” of this manual and perform any checks not already completed.

XII. Operation

I. Factory Preset Boiler Operating Parameters

(See Table 25 for Parameter Descriptions)

A. The Alpine (ALP) boiler uses a microprocessor based Honeywell control, known as a “MCBA”, to manage all boiler functions including flame supervision and modulation. Two set point or “target” boiler supply temperatures are stored in the MCBA’s memory; one for space heating and one for domestic water production. If an outdoor temperature sensor is connected to the boiler, the space heating supply set point will automatically adjust downwards as the outdoor temperature increases. For more information on this feature see the discussion on boiler water reset below.

The MCBA modulates the boiler input by varying the fan speed. As the fan speed increases, so does the amount of gas drawn into the blower. As a result, a fairly constant air-fuel ratio is maintained across all inputs.

The MCBA determines the input needed by looking at both current and recent differences between the supply temperature and the set point temperature. As the supply temperature approaches the set point temperature, the fan will slow down and the input drop. Depending on the model boiler, the minimum input is between 1/3 (high altitude) and 1/5 (sea level) of maximum input.

The MCBA also monitors boiler return and flue temperatures. In addition, all other safety controls, including the low water cut-off and safety limit, are connected into the MCBA. The MCBA uses input from all of these controls to either shut down the boiler when an unsafe condition exists or, in some cases, to correct the problem.

B. The display panel has three primary modes of operation. These are:

1. Standby Mode – Displays boiler’s current status. This is the default operating mode.
2. Parameter Mode – Used to change control settings
3. Information Mode – Displays boiler operating temperatures

Under normal conditions, the boiler is in standby mode and the display looks like that shown in Figure 49. The three digits to the right of the decimal point are the boiler’s supply temperature. The digit to the left of the decimal point is the boiler’s status code. A list of status codes, and their meanings, is shown in Table 26.

Figure 50 is a map of the menu structure for the control panel. Push the mode key to move from one mode to the next. As you change modes, the mode you are entering is shown on the display:

- a. “*PAR*” for Parameter Mode
- b. “*Info*” for Information Mode

- c. “*Stby*” for Standby Mode. Upon entering standby mode, “Stby” will briefly appear on the display and then the display will show the boiler’s status along with the supply temperature (Figure 49).

The control will return to standby mode from any other mode if no key is pressed for 20 minutes.

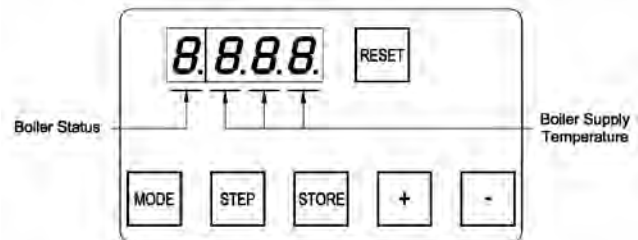


Figure 49: Normal Display In Standby Mode

C. In standby mode, it is possible to view both the heating supply set point temperature and the “domestic hot water reference set point”. The “domestic hot water reference set point” plus 45°F equals the boiler supply set point when it is responding to a call from the indirect water zone. It is not the actual domestic hot water set point. The Alpine (ALP) is designed for use with a storage type indirect water heater such as the Alliance SL™. The domestic water set point is controlled by the thermostat on the indirect water heater. The “default domestic water reference set point” is 135°F and target boiler supply temperature when responding to a call from the indirect water heater is therefore 180°F (135°F +45°F). The default heating supply set point (parameter 4) is 180°F.

In standby mode it is also possible to turn on or off either the heating or domestic water zone. There is normally no reason to turn off either of these zones and doing so is not recommended.

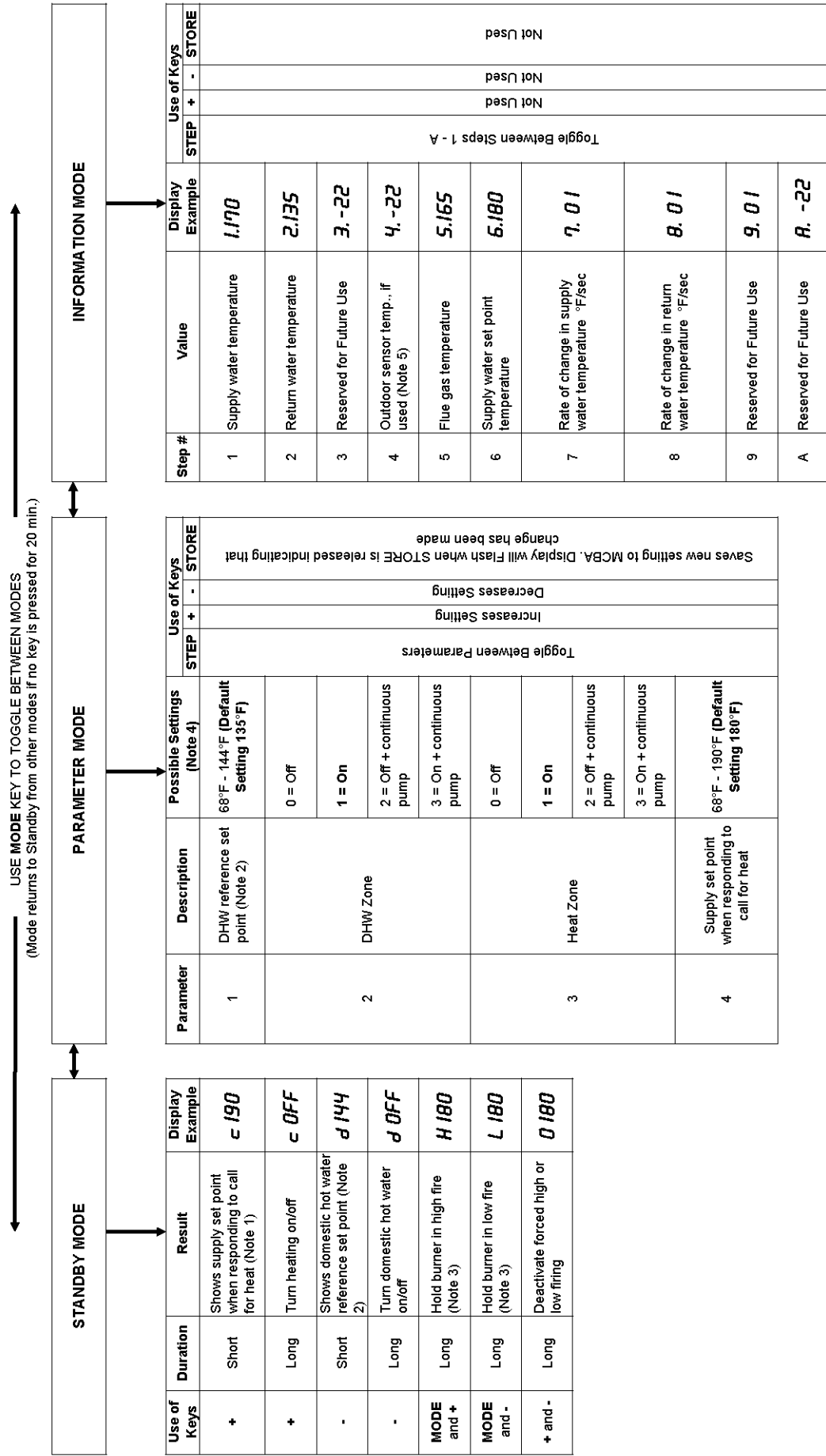
WARNING

Pushing and holding the “+” while in Standby Mode will prevent the boiler from responding to a call for heat. Pushing and holding the “-” while in Standby Mode will prevent the boiler from responding to a call for domestic water. If this happens, “cOFF” or “dOFF” will appear on the display. To turn back on the heating function, press and hold “+” until “c” and the set point temperature appears on the display. To turn back on the domestic water function, press and hold “-” until “d” and the set point temperature appears on the display. After pressing any keys, and before leaving the installation, verify that the boiler fires in response to a call for heat and domestic water.

Table 25: Parameter Descriptions

Access Code	Parameter No.	Description	Factory Setting					
			ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
No Access Code Needed	1	T3set DHW	140					
	2	DHW system	1 (On)					
	3	CH system	1 (On)					
	4	T1top CH Mode	190					
Access Code Required	5	T1foot CH Mode	130					
	6	T4 minimum	0					
	7	T4 maximum	60					
	8	T4 frost protection *	-22					
	9	T4 correction	0					
	10	Tblocking	32					
	11	Booster time	0					
	12	Tparallel shift	0					
	13/14	Maximum fanspeed CH	4450	4850	5500	6200	6300	5867
	15/16	Maximum fanspeed DHW	4450	4850	5500	6200	6300	5867
	17/18	Minimum fanspeed	1125	1250	1300	1375	1450	1267
	19	Ignition fanspeed	3000					2300
	20	CH postpump time	0					
	21	DHW postpump time	10.2					
	22	CH modulation hysteresis on	10					
	23	CH modulation hysteresis off	2					
	24	DHW modulation hysteresis on	10					
	25	DHW modulation hysteresis off	2					
	26	DHW detection hysteresis on	-8					
	27	DHW detection hysteresis off	10					
	28	CH blocking time	0					
	29	DHW blocking time	0					
	30	DHW-> CH blocking time	0					
	31	Modulate back difference T1-T2	54					
	32	RMCI Address	-1					
	33	Tplus: Setvalue addition for DHW	50					
	34-1	2nd CH-Circuit (1st digit)	0 (2nd Heating Circuit Off)					
	34-2	CH Type (2nd digit)	0 (Room Thermostat)					
	35-1	DHW 3=way valve or pump (1st digit)	1 (Hot Water Pump)					
	35-2	DHW-type (2nd digit)	3 (Storage Tank without NTC3)					
	36	Manual fanspeed	-1					
	37-1	PWM-pump level (1st digit)	4					
	37-2	PWM-pump level (2nd digit)	1					
	38	Tset hold boiler warm	36					
	39	Ttop for 2nd CH circuit	190					
	40	Tfoot for 2nd CH circuit	130					
	41	Thysteresis for 2nd CH circuit	10					
	42-1	Pump settings for CH and DHW	0 (CH Normal Pump)					
	42-2	Minimum Off Cycle (2nd digit)	0 (Not Active)					

* Circulator will start when boiler supply sensor will detect temperature 44.6° F or less



Notes

- 1) If outdoor sensor is connected, this temperature is the supply temperature setpoint when the outdoor temperature is 0°F.
- 2) "Domestic water reference set point" + 45°F = boiler supply set point when boiler is responding to a call for domestic hot water (default = 180°F).
- 3) Boiler will automatically resume modulation after 15 minutes.
- 4) Factory default settings are shown in bold.
- 5) If no outdoor sensor is connected, display reads "4. -22".

Figure 50: Basic Menu Tree

D. Two basic types of errors codes are shown on the display:

1. **Soft Lockout Codes** – When a soft lockout occurs, the boiler will shut down and the display will alternate between the number “9” and the letter “b” followed by a two digit service code. A list of these codes, and their meanings, is shown in Table 29 in Section XIV Troubleshooting. The boiler will automatically restart once the condition that caused the lockout is corrected.
2. **Hard Lockout Codes** – When a hard lockout occurs, the boiler will shut down and the display will flash the letter “E” followed by a two digit service code. A list of these codes, and their meanings, is shown in Table 30 in Section XIV Troubleshooting. Once the condition that caused the lockout is corrected, the boiler will need to be manually reset using the RESET button on the display.

Table 23: Boiler Status

First Digit	Boiler Status
0	Burner off - No call for heat or DHW
1	Pre-purge or post-purge
2	Ignition
3	Burner responding to call for heat
4	Burner responding to call for DHW
5	Checking air pressure switch
6	Burner off - Set point temperature has been reached
7	Call for heat ended. 10s heating post pump period
8	Call for DHW ended. 10s DHW post pump period
9 and b Flashing	Burner off - on soft lockout. See Troubleshooting Section to determine meaning of error code.
A	Boiler responding to call from heating zone
H	Burner on - Held in high fire
L	Burner on - Held in low fire

E. If an outdoor sensor is installed, the boiler will automatically adjust the heating zone set point temperature based on the outdoor reset curve in Figure 51. The maximum set point is defined by parameter 4 (factory set to 180°F) when the outdoor temperature is 0°F or below. The minimum set point temperature shown is 100°F when the outdoor temperature is 60°F or above. As the outdoor temperature falls the supply water target temperature increases. For example, if the outdoor air temperature is 30°F, the set point temperature for the supply water is 140°F.

F. An indirect water heater thermostat can be connected between terminals 2 and 4 on the terminal strip. When this thermostat closes, the central heating circulator will be turned off and the DHW circulator will be turned on.

G. An external limit control can be installed between terminals 5 and 6 on the terminal strip. Be sure to remove the jumper between terminals 5 and 6 when adding an external limit control to the system. If the external limit opens, the boiler will shut down and error code “b 26” will be displayed. If the limit installed is a manual reset type, it will need to be reset before the boiler will operate.

H. The sequence of operation for a Alpine Series boiler on a call for heat from a thermostat is as described below:

1. When power is first turned on, 120V is provided to the MCBA, the combustion fan and the LWCO transformer. A separate 50VA transformer, connected directly to the MCBA, powers all other low voltage circuits.
2. For the first few seconds after power-up the control module goes through a self check.
3. When there is a call for heat, the control module checks to make sure the air pressure switch is open. If it is, the combustion fan will be energized and will ramp up to ignition speed. When the air pressure switch closes, a 10 second prepurge is activated.
4. After the prepurge, the control module energizes the gas control valve and the spark for 4.5 seconds. If a flame is established and proved, the control allows the flame to stabilize for 5 seconds at the combustion fan ignition speed setting. If the flame fails to prove, the control module will attempt to light the burner 4 more times. If a flame is still not established, the control will lockout.
5. Once the flame stabilization period has ended, the MCBA allows the burner to modulate. The actual firing rate is dependent upon the measured current and recent differences between the set point temperature and the supply temperature. If an outdoor sensor is connected to the control module and the boiler is responding to a call for heat, the set point temperature will be determined by the outdoor reset curve shown in Figure 51.
6. Once the set point temperature is reached, the MCBA will turn the burner off and allow the combustion fan to operate in postpurge for 30 seconds before it turns off.
7. The central heating pump will continue to operate until the room thermostat has been satisfied.
8. A demand for domestic hot water (DHW) is given priority on Alpine Series boilers. If a call for DHW is received while the boiler is responding to a call for heat, the heating circulator is de-energized until the call for DHW is satisfied.

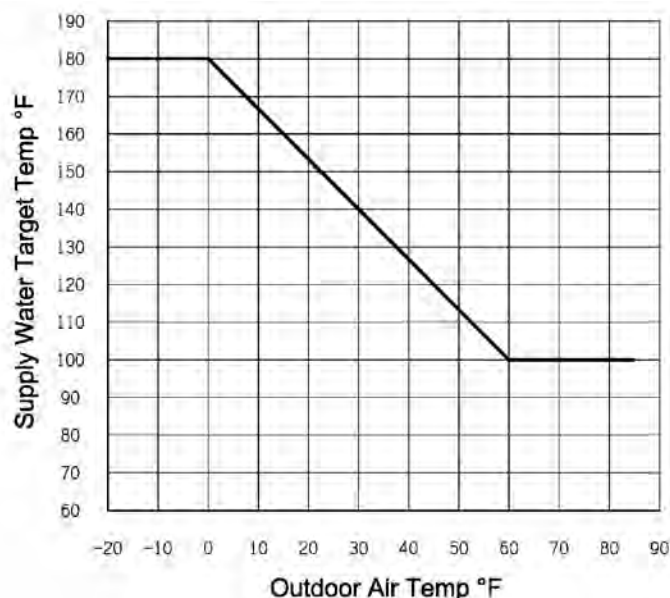


Figure 51: Outdoor Reset Curve

II. Field Adjustable Boiler Operating Parameters

MCBA control factory programmed operating parameters will result in satisfactory operation under most conditions. However, because all systems are different, there may exist situations where boiler operation may be enhanced by adjusting a few of these parameters in the field. **A total of 46 field adjustable parameters** are stored in the memory of the MCBA control. By adjusting these parameters an installer can fine-tune MCBA operation under different fields conditions. Refer to Table 25 for the list of adjustable parameters and their factory settings.

Parameters are numbered from “1” to “42-2”. Parameters “1” thru “4” are accessible by anyone. Parameters “5” thru “42-2” require an access code to be viewed and adjusted.

Parameters may be changed by:

- Using the keypad on the boiler as input device to make adjustments.
- Using personal computer, hooked up to MCBA control via the GPI PC Interface Kit (P/N 101152-01), available from US Boiler, as input device to make adjustments.

Additionally, either the keypad or the personal computer can be used to obtain information about the boiler current status and operating history.

A. Adjusting Parameters via Boiler Keypad

Entering the Access Code

1. With boiler running, toggle the Mode key until you reach the (STBY) Standby mode.
2. Depress and hold the Step key and then quickly depress and hold the Mode key for 2 - 6 seconds until the display reads (CODE). Release the Mode key, then the Step key. The display should show a ‘C’ followed by a random two digit number.
3. Use the + or - keys to scroll to the number 05.
4. Press the Store key momentarily and watch for the display to blink twice. If the access code has been successfully entered, the menu tree will be expanded to include the items shown inside the dashed lines in Figure 52. Access to parameters 5 - 42 will be possible by following the instructions in Section C. After 15 minutes have passed without any keys being pressed, access to the expanded menu will end and the access code will need to be reentered to regain access to parameters 5 - 42.

NOTE: Access Code is not required for Parameters 1 thru 4.

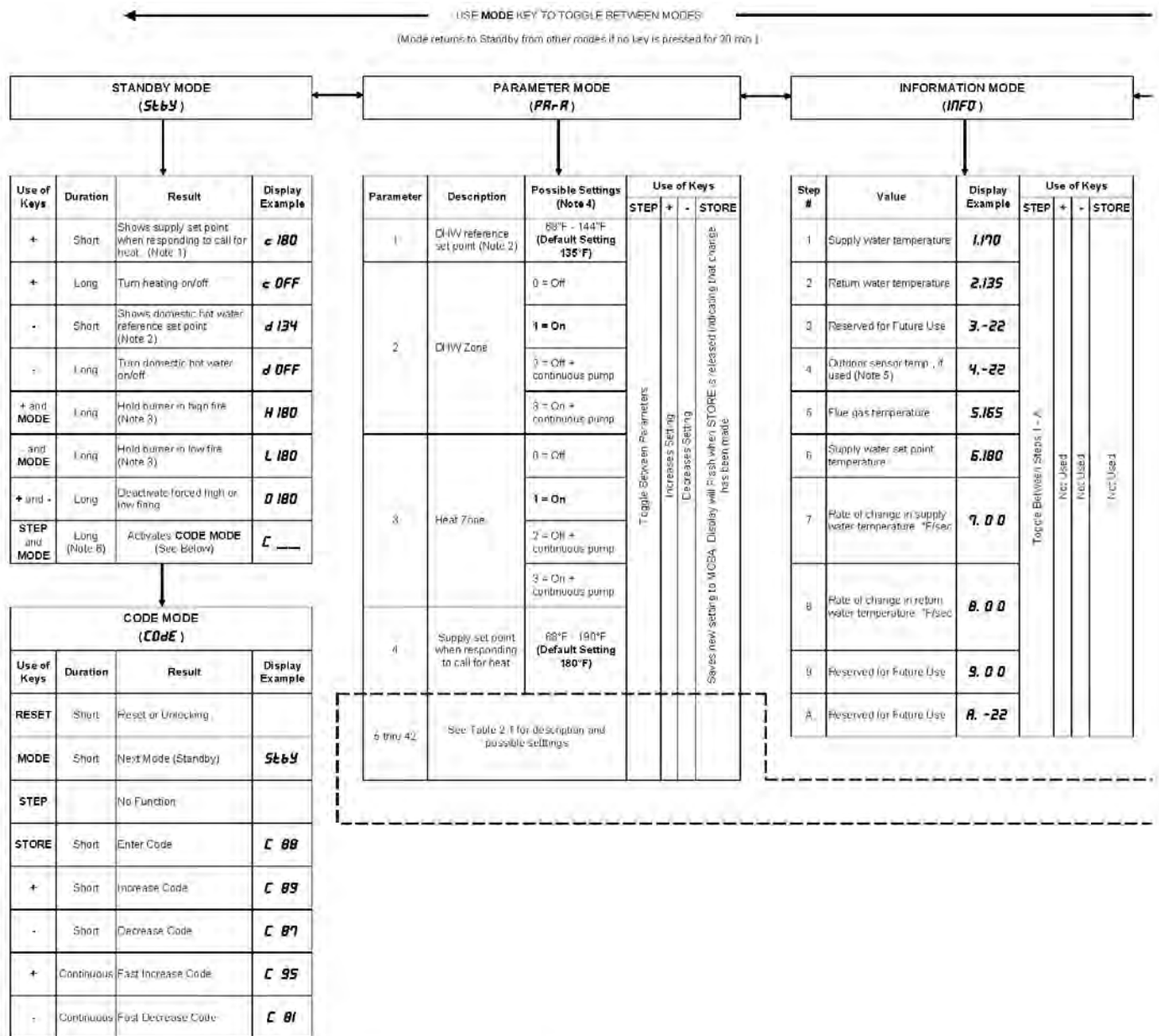
Changing Parameters

1. Toggle the Mode key until you reach (PARA) Parameter mode.
2. Press the Step key to scroll through the parameters until you reach the desired parameter number.
3. Use the + or - key to scroll to the desired parameter setting.
4. Press the Store key momentarily and watch for the display to blink once. The parameter setting has now stored it new value.
5. When using the keypad, all parameters show up on the boiler display as two-digit numbers. This creates the following special situations:
 - a. Two parameters are required to define some of the fan speeds. For example, the maximum CH fan speed is defined by Parameters 13 and

WARNING

Improper setting of parameters can cause unreliable or unsafe operation, resulting in property damage, personal injury, or loss of life:

- **Changing parameters should only be attempted by a professional heating service technician.**
- **Do not change any parameters not described in this manual without first consulting the manufacturer.**
- **After changing any parameters, carefully confirm proper boiler operation before leaving the installation site.**



- 1) If outdoor sensor is connected, this temperature is the supply temperature setpoint when the outdoor temperature is 0°F.
- 2) "Domestic water reference set point" + 45°F = boiler supply set point when boiler is responding to a call for domestic hot water (default = 180°F).
- 3) Boiler will automatically resume modulation after 15 minutes.
- 4) Factory default settings are shown in bold.
- 5) If no outdoor sensor is connected, display reads "4.-22".
- 6) Depress and hold the **STEP** key and then quickly depress and hold the **MODE** key to activate **CODE MODE**. **CODE MODE** is active when the display shows a 'C' followed by a 2 digit random number.
- 7) Displays the last six error codes (1-6) beginning with the most recent error.

Figure 52: Expanded Menu Tree (Cont'd on next page)

(Mode returns to Standby from other modes if no key is pressed for 20 min.)

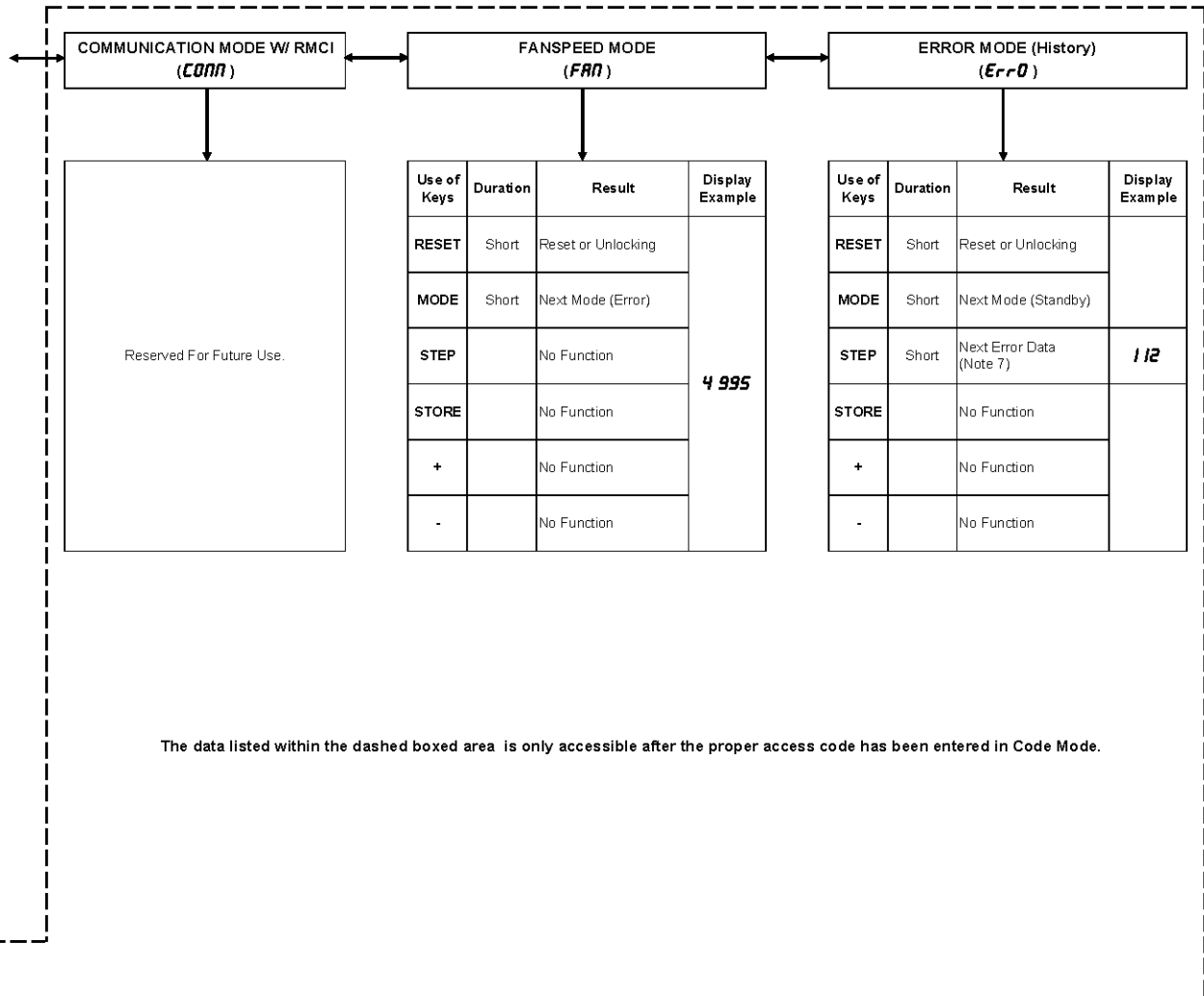


Figure 52: Expanded Menu Tree (cont'd.)

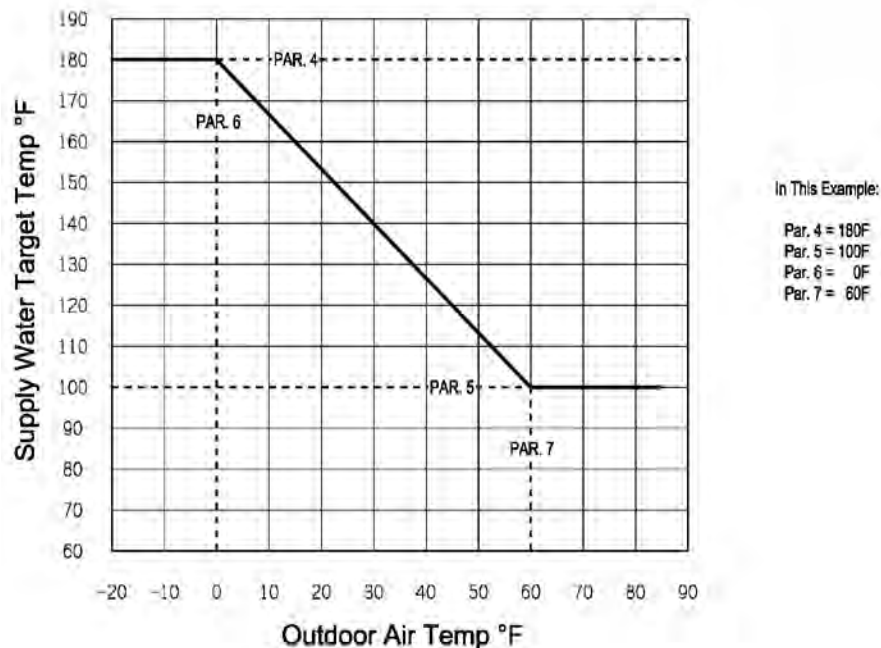


Figure 53: Adjusting Boiler Water Reset Curve

14; Parameter 13 defines the “thousands” and hundreds” places and Parameter 14 defines the “tens” and “ones” places. The ignition fan speed is only adjustable in increments of hundreds, so only one parameter (19) is required to define it.

IMPORTANT: Field adjustment of fan speeds is not recommended.

- b. In some cases one two-digit number defines two separate parameters. For example, if Parameter 34 is viewed on the boiler display, the “tens place” is Parameter 34-1 (default value is 0) and the “ones place” is Parameter 34-2 (default value is also 0). As viewed on the boiler display, the factory set Parameter 34 will therefore appear as “00”. If Parameter 34-2 is changed to accept a 0-10 VDC reading from an AM-4 (see Section D), Parameter 34 will then read “04” as viewed on the boiler display.

Common Field Adjustments

Please note that although it is physically possible to adjust all parameters listed in Table 25 the parameters shaded gray **need not be adjusted** in the field. In case these parameters are accidentally changed, they should be restored to default factory settings shown in Table 25 “Parameter Descriptions”.

Parameters **permitted to be field adjusted** are non-shaded ones in Table 25. In order to change these parameters, three subsequent tasks must be performed:

1. Adjusting the target boiler supply temperature when responding to call from an indirect water heater - The default IWH target supply temperature is 180°F. Since most indirect water heaters have ratings based on 180°F boiler supply temperature, it should rarely be necessary to adjust this parameter.
2. Changing the boiler water reset curve - When an outdoor temperature sensor is connected to a Alpine boiler, the MCBA will adjust the target boiler supply temperature based on outdoor temperature when the boiler is responding to a call for central heat. Figure 53 is a graph showing the target boiler supply temperature as a function of outdoor temperature. The curve shown in Figure 53 is that obtained with the factory set parameters. The shape of this curve may be changed by changing Parameters 4, 5, 6, and 7 as shown in Figure 53. Refer to Part I Section C for the procedure to change parameters.

If the outdoor sensor is not connected to the boiler,

the target supply temperature is always defined by Parameter 4 when the boiler is responding to a call for central heat, regardless of the outdoor temperature. In this case, the settings of Parameters 5, 6, and 7 are meaningless.

3. Allowing an external control to directly manage modulation of the boiler. The MCBA control permits the Alpine to be modulated solely using 0 - 10 VDC signal supplied by an external control, like multiple - modulating boiler control. When this function is used, the boiler no longer responds to a heating thermostat, or an outdoor sensor connected to a boiler MCBA itself. The boiler will respond normally to the call from the domestic hot water thermostat.

In order for the boiler MCBA control to recognize 0 - 10 VDC signal, Parameter 34-2 (“Room Thermostat” - see Table 25) must be re-programmed. The factory programmed default value for Parameter 34 is “0”. It must be re-programmed to value “4” for MCBA to recognize 0 - 10 VDC signal. Once this parameter is changed, the boiler will ignore any call from a thermostat connected across boiler terminals 1 and 2 (see Figures 35 and 36). It will continue to respond to a call from the indirect water heater thermostat.

Also, Parameters 2 and 3 (see Table 25) should be left at factory settings they could be changed inadvertently (for example, pushing and holding “+” or “-” key while boiler is in Standby Mode will change them). If the boiler does not respond to a call from one or both thermostats, verify that Parameters 2 and 3 are both “ON”.

4. Communication, Fan Speed and Error Modes

In addition to providing access to all field adjustable parameters, entering the access code also provides access to three additional mode menus using the boiler keypad. These are shown in Figure 52:

- a. Communication Mode - This mode does not currently have any function.
- b. Fan Speed Mode - Allows the user to view the blower fan speed (firing rate is determined by fan speed).
- c. Error Mode - Pressing STEP while in Error mode allows the user to see the six most recent error codes.

B. Adjusting Parameters via Personal Computer with GCI Interface

1. Operating System Requirements

The GCI Interface requires a PC computer running a Windows 98/NT/2000 or XP operating system. In addition, the PC must have an open serial port.

2. Connecting Personal Computer to MCBA Control

- Connect the serial cable from the GCI to the computer.
- Plug in the GCI.
- Open the lower front jacket panel. Loosen the screws holding the control cover and swing down the control cover so that the control compartment is open.
- Connect the ribbon cable from the GCI into the open receptacle on the MCBA next to the ribbon cable from the boiler display/keypad (Figure 54).

3. Installing GCI Interface Gascom Software

- Gascom is the name of the software, which must be installed on personal computer in order to communicate with MCBA control via GCI Interface.
- Insert the Gascom CD in your computer's CDROM drive and wait a few seconds for the software to prompt you to continue setup. Select "NEXT" to continue the installation. Follow the prompts to install the software. U.S. Boiler highly recommends accepting the default directories recommended.
- The last screen allows the user to select whether or not to restart the computer. The computer must be restarted prior to using the Gascom program.
- U.S. Boiler recommends the user register the software on the date of installation however registration is not required. Registration gives the user access to our technical support personnel online as well as information about software updates. To register the software click on the "Gascom Online" icon on the desk top and select "Registration". You will be asked to fill out a short form including your e-mail address. Once the form is submitted a return e-mail will be sent to you confirming the information you entered along with your registration number.

- Open Gascom by selecting the "Gascom 1.0" icon on the desk top. Before using the program for the first time it must be configured properly to work with the Alpine boiler and your computer. Go to the menu bar and select "Gascom" and then "Configuration". Refer to the menu tree shown in Figure 55.
 - From the drop down box labeled "MCBA1400" select the "Standard HR7A60Hz" option.
 - From the drop down box labeled "Interface device" select the "CGI232" option.
 - The "Communication port" setting is the serial port on the PC to which the GCI interface is connected. Most often this serial port will be "COM1".
 - The "Gascom Directory" field will contain the correct field and will not need to be changed as long as you accepted all of the default file locations during installation. Otherwise, you will need to locate the Gascom directory on your hard drive and enter the correct path name in this field.
 - If you wish to access Parameters 5 to 42 enter "05" in the "Access Code" field (the access code will need to be entered every time the Gascom program is reopened).

Changing Parameters

Open the Gascom Program

- If not already done connect GCI PC Interface, and install the Gascom software as described in Part II of this manual and open the Gascom software.
- Click on the "Parameters" menu on the top of the screen.
- Click on "Read from MCBA". After a few seconds, a list of parameters and their settings will appear on the screen. Parameters which are not accessible are grayed out. If the access code has not been entered in the configuration screen, this will include Parameters 5-42. Parameters 43 and above are always grayed out because they are inaccessible in the field.

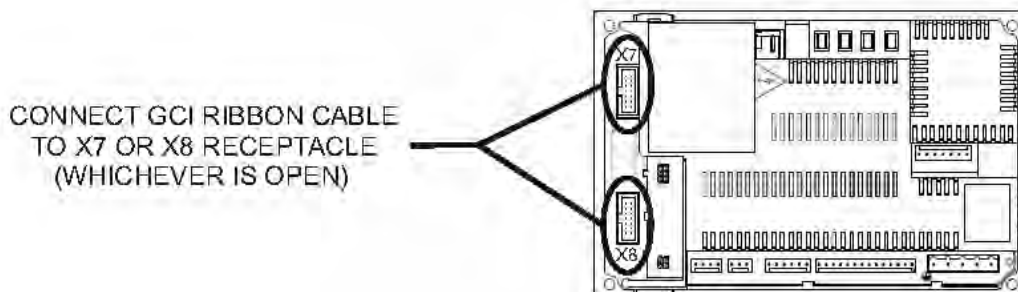
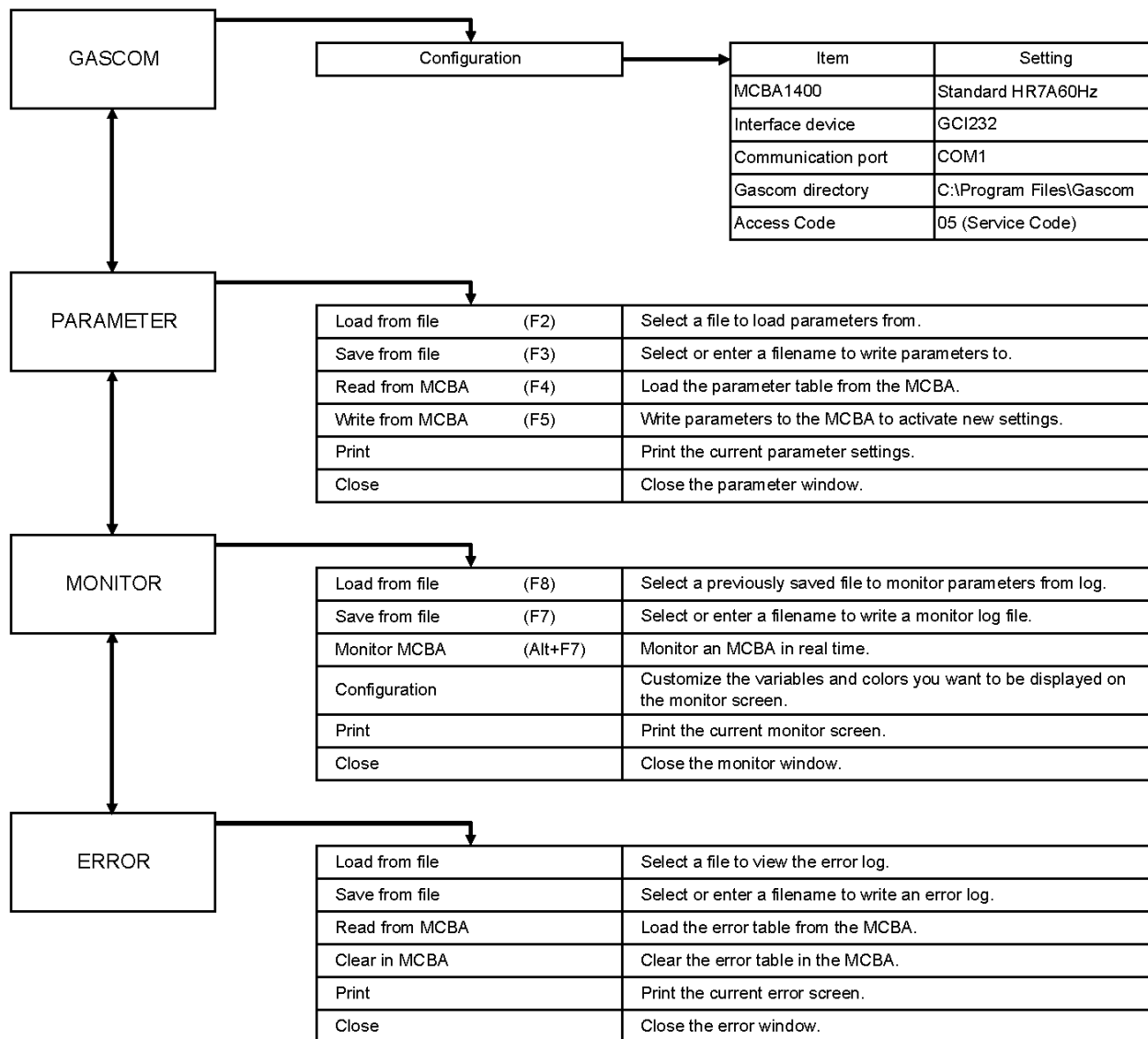


Figure 54: MCBA Control



Note: You can switch between menus by using the 'F6' key.

Figure 55: Gascom Menu Tree

- Double-click on the desired parameter. A window will open with either a field or a pull down list of options will appear. Enter or select the desired value for the parameter.
- Click OK.
- Repeat Steps (3) - (5) to change any other desired parameters.
- After all parameters have been changed, click on the "Parameters" menu at the top of the screen and then click on "Write to MCBA". After a few seconds, the display on the boiler will blink. This indicates that the parameters are written to the control and are in effect.

Field Adjustable Parameters

Refer to Field Adjustable Parameters under A. Adjusting Parameters via Boiler Keypad on pages 76 and 79 of this manual.

Using Gascom To Monitor The MCBA

From the Monitor Menu select "Monitor MCBA". This will bring up a window which plots the following information:

- Temperatures:

Flow - Actual boiler supply temperature

Return - Actual Boiler return temperature

Outdoor - Temperature being read by outdoor sensor if it is connected. If it is not, temperature reading is "-22".

Fluegas - Flue gas temperature

Set - Target boiler supply temperature

- Status:

Room - Room thermostat ("1" = Calling, "0" = Not Calling)

Hotwater - Indirect water heater thermostat (“1” = Calling, “0” = Not Calling)

Pump - Heating circulator (“1” = On, “0” = Off)

Air-switch - Status of air pressure switch (“1” = Closed, “0” = Open)

Gaspressure - This is actually the status of the high limit (“1” = Closed, “0” = Open)

GasValve - Status of gas valve (“1” = Open, “0” = Closed)

Flame - Shows whether the MCBA detects the presence of the burner flame (“1” = Flame, “0” = No Flame)

DHW Pump - Indirect water heater circulator (“1” = On, “0” = Off)

3. RPM:

Fan - Actual speed of fan

Set - Target speed of fan.

Reading the MCBA Error Log

1. The MCBA keeps a log of the last six error codes. To view these error codes select “Read from MCBA” from the Error Menu.
2. This data can be saved as a file to disk by selecting “Save to file” from the Error Menu or printed by selecting “Print” from the same menu.
3. Error codes can also be removed from the memory of the MCBA by selecting “Clear in MCBA” from the Error Menu.

III. Component Test Procedures

A. Flame Signal Check

1. The flame signal can be checked between terminal number 7 on the low voltage terminal strip and ground. A good signal reading should be 6 VDC or greater.

2. If the signal is lower than 6 VDC, check the continuity of the ground wire between the ignitor and the junction box. If the ground wire is suspect replace the ground wire.
3. If the ground wire is in good condition, remove the ignitor and flame sensor to inspect the ceramic insulator for cracks. If none are found, sand off any oxide deposits which formed on the electrodes. If the insulator is cracked or the electrode cannot be properly cleaned, replace the ignitor and flame sensor. When replacing the ignitor and flame sensor, be sure to replace the ignitor and flame sensor gasket as well.
4. Other problems that can cause a low flame signal include:
 - An improperly adjusted throttle (confirm that the CO₂ is within the limits shown in the installation manual).
 - Fouling of the burner (remove the burner and clean with compressed air).
 - Low inlet gas pressure (verify that gas pressure is within the limits shown on the rating plate).
 - Grounded 24 VAC or sensor wiring (this problem will result in no flame voltage reading, but will normally not result in an E02 error because there is still adequate flame current).

B. NTC Temperature Sensors

1. The supply, return, flue, and outdoor reset sensors used on the Alpine are of the resistance type.
2. The Table 27 shows the range of resistance values for these sensors at various temperatures.

Table 27: NTC Sensor Resistance Values

Sensor Resistance Values			
Temperature (°F)	Minimum Value (Ohms)	Nominal Value (Ohms)	Maximum Value (Ohms)
0	82304	89767	97227
5	71959	78310	84663
10	62144	67449	72755
15	53074	57443	61814
20	46557	50262	53966
25	40650	43770	46890
30	35665	38312	40960
32	33669	36129	38590
35	31370	33622	35874
40	27543	29443	31340
45	24387	26028	27670
50	21422	22804	24187
55	19107	20301	21494
60	16887	17906	18925
65	15073	15948	16823
68	13981	14773	15566
70	13407	14157	14908
75	11970	12616	13262
80	10710	11268	11826
85	9571	10048	10524
90	8611	9026	9441
95	7699	8054	8409
100	6965	7275	7585
105	6259	6526	6794
110	5668	5899	6129
115	5118	5319	5519
120	4636	4810	4984
125	4208	4359	4510
130	3815	3945	4074
135	3479	3591	3703
140	3155	3252	3350
145	2880	2974	3067
150	2617	2705	2793
155	2391	2475	2559
160	2181	2261	2340
165	1993	2069	2146
170	1825	1898	1971
175	1670	1739	1808
180	1519	1600	1682
185	1406	1467	1529
190	1297	1355	1414
195	1192	1247	1302
200	1100	1153	1205
205	1014	1064	1114
210	937	984	1032
212	906	952	999

XIII. Service and Maintenance

DANGER

This boiler uses flammable gas, high voltage electricity, moving parts, and very hot water under high pressure. Assure that all gas and electric power supplies are off and that the water temperature is cool before attempting any disassembly or service.

Do not attempt any service work if gas is present in the air in the vicinity of the boiler. Never modify, remove or tamper with any control device.

WARNING

This boiler must only be serviced and repaired by skilled and experienced service technicians.

If any controls are replaced, they must be replaced with identical models.

Read, understand and follow all the instructions and warnings contained in all the sections of this manual.

If any electrical wires are disconnected during service, clearly label the wires and assure that the wires are reconnected properly.

Never jump out or bypass any safety or operating control or component of this boiler.

Read, understand and follow all the instructions and warnings contained in ALL of the component instruction manuals.

Assure that all safety and operating controls and components are operating properly before placing the boiler back in service.

NOTICE

Warranty does not cover boiler damage or malfunction if the following steps are not performed at the intervals specified.

A. Continuously:

1. Keep the area around the boiler free from combustible materials, gasoline and other flammable vapors and liquids.
2. Keep the area around the combustion air inlet terminal free from contaminants .
3. Keep the boiler room ventilation openings open and unobstructed.

B. Monthly Inspections:

1. Inspect the vent piping and outside air intake piping to verify they are open, unobstructed and free from leakage or deterioration. Call the service technician to make repairs if needed.
2. Inspect the condensate drain system to verify it is leak tight, open and unobstructed. Call the service technician if the condensate drain system requires maintenance.

3. Inspect the water and gas lines to verify they are free from leaks. Call the service technician to make repairs if required.

CAUTION

Water leaks can cause severe corrosion damage to the boiler or other system components. Immediately repair any leaks found.

C. Annual Inspections and Service: In addition to the inspections listed above the following should be performed by a service technician once every year.

1. If equipped, test the low water cutoff by pressing the “Test” button located at its end. The yellow light should come on and “E12” should flash on the display. Push the reset button on the display to restore normal operation. If the yellow light does not come on, determine why the low water cutoff is not working properly.
2. Follow the procedure for turning the boiler off found in the Alpine™ Series Lighting and Operating Instructions.

3. Inspect the wiring to verify the conductors are in good condition and attached securely.

CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

4. Remove the ignition electrode and inspect it for oxides. Clean the oxides from the electrode with steel wool. Do not use sandpaper for the cleaning. Inspect the ceramic insulator for cracks and replace the ignitor assembly if necessary. Check the ignitor electrode spacing gap. Refer to Figure 56 "Ignitor Electrode Gap" for details.

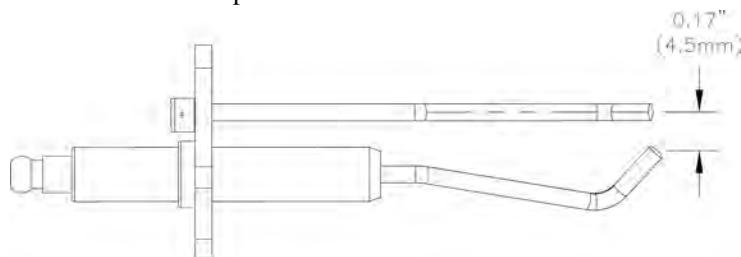


Figure 56: Ignitor Electrode Gap

5. Remove the fan/gas valve assembly from the burner hood. Inspect for lint and dust. If significant lint and dust are found, disassemble the fan/gas valve assembly to expose the swirlplate and fan inlet (see the exploded diagram in the parts list at the back of this manual). Vacuum these parts as required, being careful not to damage the vanes on the swirlplate.
6. Remove the burner hood to access the burner and the combustion chamber.
7. Remove the burner and vacuum any dust or lint from the burner. If the burner shows signs of deterioration or corrosion, replace it immediately. Inspect the burner gasket and replace, if necessary.
8. Inspect the heat exchanger, clean and vacuum any debris found on the surfaces. A soft nylon brush must be used for cleaning. Remove insulation disc and clean the surfaces by flushing with clean water. Drain and flush the inside of the heat exchanger and condensate collector. Do not use any cleaning agents or solvents. Re-install insulation disc.
9. Inspect the condensate trap to verify it is open and free from debris. Inspect condensate line integrity between boiler and condensate neutralizer (if used) and condensate neutralizer and the drain. Clean/repair if needed.

If the condensate neutralizer is used, check pH before and after the neutralizer to determine neutralizing effectiveness. Replace limestone chips and clean out the neutralizer if needed.

10. Reinstall the burner, burner hood and fan/gas valve assembly.
11. Reconnect any wiring which has been disconnected.
12. Inspect the heating system and correct any other deficiencies prior to restarting the boiler.
13. Follow Section XI System Start-up before leaving installation.
14. Perform the combustion test outlined in Section XI System Start-up.
15. Verify that the system PH is between 8.2 and 9.5/.
16. Check for vent terminal obstructions and clean as necessary.

D. Recommended Heating System Water Treatment Products:

1. System Cleaning and Conditioning:

- a. The following heating system water treatment products are recommended for an initial existing heating system sludge removal, initial boiler cleaning from copper dust, flux residue and any boiler debris and for preventive treatment as corrosion/scale inhibitors:
 - i. Fernox™ Restorer (universal cleaner, sludge remover, scale remover, flux residue/debris remover, corrosion inhibitor)
 - ii. Fernox™ Protector (Alphi 11, CH#, Copal) (sludge remover, corrosion inhibitor)
Follow manufacturer application procedure for proper heating system/boiler cleaning and preventive treatment.
Above referenced products are available from Cookson Electronics Company, 4100 Sixth Avenue, Altoona, PA 16602, Tel: (814) 946-1611 and/or selected HVAC distributors. Contact US Boiler for specific details.
 - iii. Equivalent system water treatment products may be used in lieu of products referenced above.

2. System Freeze Protection:

- a. The following heating system freeze protection products are recommended for Alpine boilers:
 - i. Fernox™ Protector Alphi 11 (combined antifreeze and inhibitor).
Follow manufacturer application procedure to insure proper antifreeze concentration and inhibitor level.
Above referenced product is available from Cookson Electronics Company, 4100 Sixth Avenue, Altoona, PA 16602, Tel: (814) 946-1611 and/or selected HVAC distributors. Contact US Boiler for specific details.

- b. Equivalent system freeze protection products may be used in lieu of product referenced above. In general, freeze protection for new or existing systems must use specially formulated glycol, which contains inhibitors, preventing the glycol from attacking the metallic system components. Insure that system fluid contains proper glycol concentration and inhibitor level. The system should be tested at least once a year and as recommended by the manufacturer of the glycol solution. Allowance should be made for expansion of the glycol solution.

CAUTION

Use only inhibited propylene glycol solutions specifically formulated for hydronic systems. Do not use ethylene glycol, which is toxic and can attack gaskets and seals used in hydronic systems.

E. Condensate Overflow Switch and Condensate Trap Removal and Replacement:

For removal or replacement of the condensate overflow switch and/or condensate trap follow the steps below. For parts identification, refer to Section XV "Repair Parts".

1. Condensate Overflow Switch Removal and Replacement:

- a. Disconnect power supply to boiler.
- b. Remove two (2) wire nuts and disconnect overflow switch wire pigtails from boiler wiring.
- c. Using pliers, release spring clip securing the overflow switch to condensate trap body and remove the switch. Note that the switch has factory applied silicon adhesive seal, which may have to be carefully cut all around to facilitate the switch removal.
- d. Insure the trap overflow switch port is not obstructed with silicon seal debris, clean as needed.
- e. **Apply silicon seal to the replacement switch threads and install the switch into the trap body making sure it is properly oriented - the arrow molded into the switch hex end side must face down for proper switch operation. See Figure 57 "Condensate Overflow Switch Orientation" for details.**

- f. Reconnect the switch wire pigtails to the boiler wiring and secure with wire nuts.
 - g. Restore power supply to boiler. Fill up the trap (see Section V "Condensate Disposal") and verify the switch operation.
- #### 2. Condensate Trap Removal and Reinstallation:
- a. Disconnect power supply to boiler.
 - b. Remove two (2) wire nuts and disconnect overflow switch wire pigtails from boiler wiring.
 - c. Disconnect pressure switch hose from condensate trap.
 - d. Disconnect outside condensate compression fitting from condensate trap stab.
 - e. Using pliers, release spring clip securing the overflow switch to condensate trap body and remove the switch. Note that the switch has factory applied silicon adhesive seal, which may have to be carefully cut all around to facilitate the switch removal.
 - f. Using pliers, release spring clip securing condensate trap body to the heat exchanger bottom drain stab.
 - g. Firstly, pull the trap downwards to release from the heat exchanger bottom drain stab; secondly, pull the trap end from left side jacket panel sealing grommet and remove the trap from boiler.
 - h. To reinstall the trap, reverse above steps.
 - i. If the original condensate overflow switch is to be re-used, follow the appropriate switch removal steps from Condensate Overflow Switch Removal and Replacement procedure above.
 - j. **Insure that fresh silicon sealant is applied to the overflow switch threads, and the switch is properly oriented relative to the trap body - the arrow molded into the switch hex side end must face down for proper switch operation. See Figure 57 "Condensate Overflow Switch Orientation" for details. Insure that pressure switch hose is reconnected to the trap.**
 - k. Restore power supply to boiler. Fill up the trap (see Section V "Condensate Disposal") and verify the switch operation.

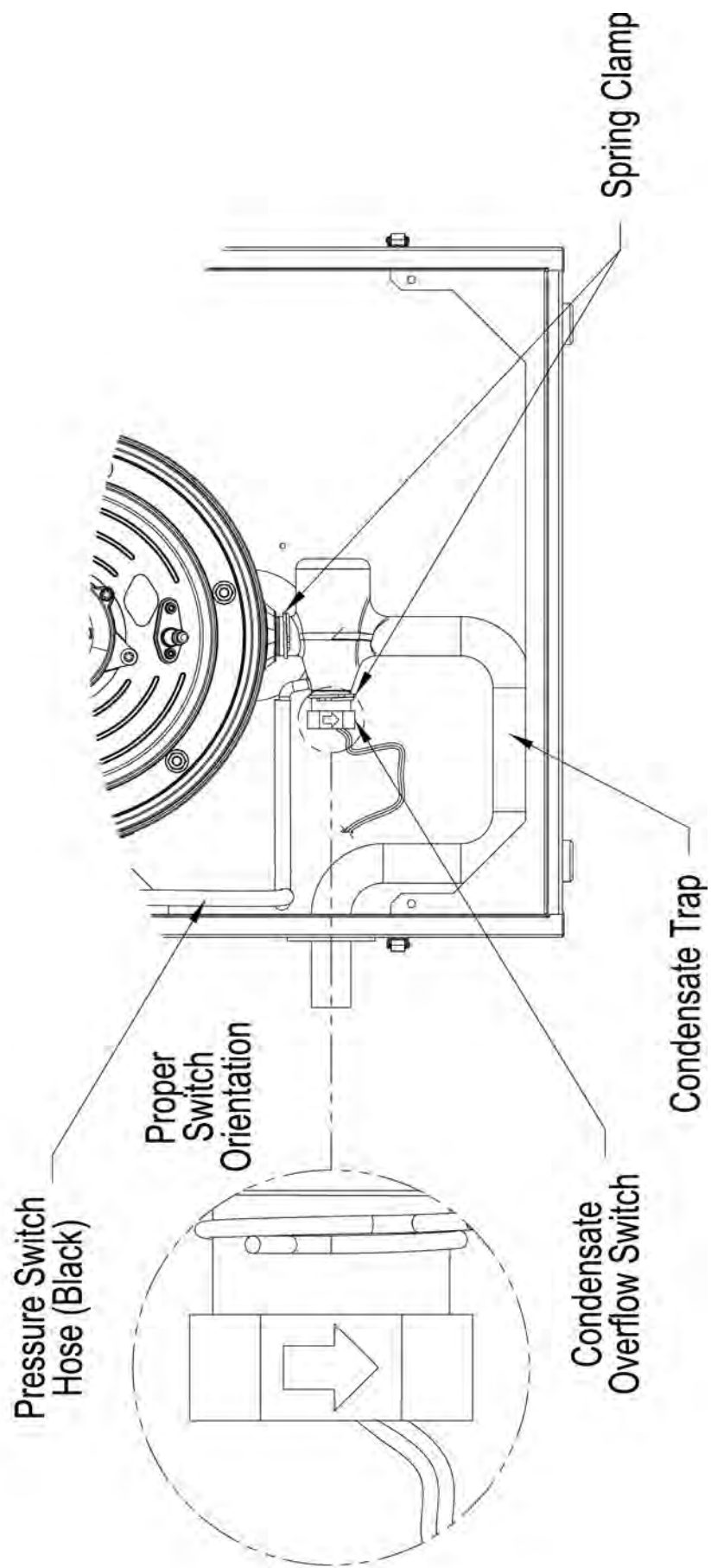


Figure 57: Condensate Overflow Switch Orientation

XIV: Troubleshooting

WARNING

Turn off power to boiler before replacing fuses or working on wiring.

A. Troubleshooting problems where no error code is displayed. Refer to Table 28 for problems and possible causes.

Table 28: No Error Code Displayed

CONDITION	POSSIBLE CAUSES
Display Blank, Fan off, LWCO lights off	<ul style="list-style-type: none">• No 120VAC Power at boiler. Check breaker and wiring between breaker panel and boiler
Display Panel Blank, Fan running	<ul style="list-style-type: none">• Loose 120VAC connection wiring between boiler J-Box and MCBA• Blown "F1" fuse in MCBA (see Figure 58 for location). Replace with 5A fuse provided
Display reads "U.125" continuously, Fan running	<ul style="list-style-type: none">• Defective AT250 transformer• Blown "F3" fuse in MCBA (see Figure 58 for location). Replace with 4A slow-blow fuse provided
Boiler not responding to call for heat, Status code on display ="0" (see Figure 50)	<ul style="list-style-type: none">• Boiler is not seeing call for heat. Check thermostat or zone wiring for loose connection, miswiring, or defective thermostat/zone control.
Boiler fires, but display panel is blank	<ul style="list-style-type: none">• Loose ribbon cable• Defective display

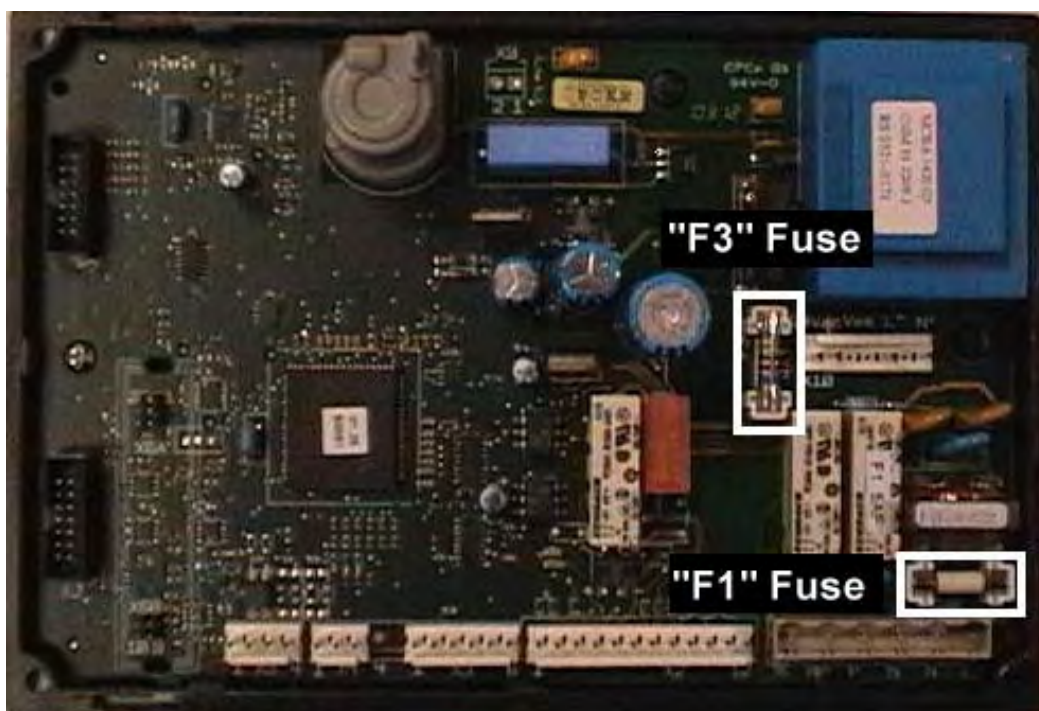


Figure 58: MCBA Fuse Location

B. Trouble shooting problems where a soft lockout code is displayed. When a soft lockout occurs, the boiler will shut down and the display will alternate between the number “9” and the letter “b” followed by a two digit service code. The boiler will automatically restart once the condition that caused the lockout is corrected.

Table 29: Soft Lockout Codes Displayed

CODE	CONDITION	POSSIBLE CAUSES
b 08	Pressure switch circuit open	<ul style="list-style-type: none"> • Blockage in intake or vent system. • Vent and/or intake system not constructed in accordance with Part VI. • Blocked or leaking pressure switch tubing • Heat exchanger or burner blockage • Terminals exposed to high winds • Blockage in condensate trap above vent.
b 18	MCBA supply sensor detected temperatures in excess of 200°F	<ul style="list-style-type: none"> • Heating load at time of error was far below the minimum firing rate of the boiler • Defective primary pump or no flow in primary loop (Piping Method 1) • Control system miswired so that boiler operation is permitted when no zones are calling
b 19	MCBA return sensor detected temperatures in excess of 200°F	<ul style="list-style-type: none"> • See possible causes for “b18” • Flow through boiler reversed • Sensor wiring reversed
b 24	MCBA is reading a return sensor temperature higher than the supply sensor temperature. Condition must be present for at least 75s for this error code to appear.	<ul style="list-style-type: none"> • Flow through boiler reversed. Verify correct piping and pump orientation. • No boiler water flow. Verify that system is purged of air and that appropriate valves are open. • Sensor wiring reversed. • Supply or return sensor defective.
b 25	Supply water temperature has risen too quickly	<ul style="list-style-type: none"> • See possible causes for “b18” • Inadequate boiler water flow. Verify that pump is operating and that pump and piping are sized per Part VIII of this manual
b 26	Boiler safety limit, or external limit wired across terminals 3&4, is open.	<ul style="list-style-type: none"> • See possible causes for “b18” • Defective supply sensor.
b 30	Temperature rise between supply and return is too high.	<ul style="list-style-type: none"> • Inadequate boiler water flow. Verify that pump is operating and that pump and piping are sized per Part VIII of this manual
b 61	Pressure switch circuit closed with fan off	<ul style="list-style-type: none"> • Blockage in pressure switch hose • Pressure switch wires shorted together • Defective pressure switch • Loose or miswired fan speed harness (if “b61” error code is observed while fan is running)
b 65	Fan is not achieving set point speed	<ul style="list-style-type: none"> • Loose or incorrect fan speed control connection • Defective fan

C. Trouble shooting problems where a hard lockout code is displayed. When a hard lockout occurs, the boiler will shut down and the display will flash the letter “E” followed by a two digit service code. Once

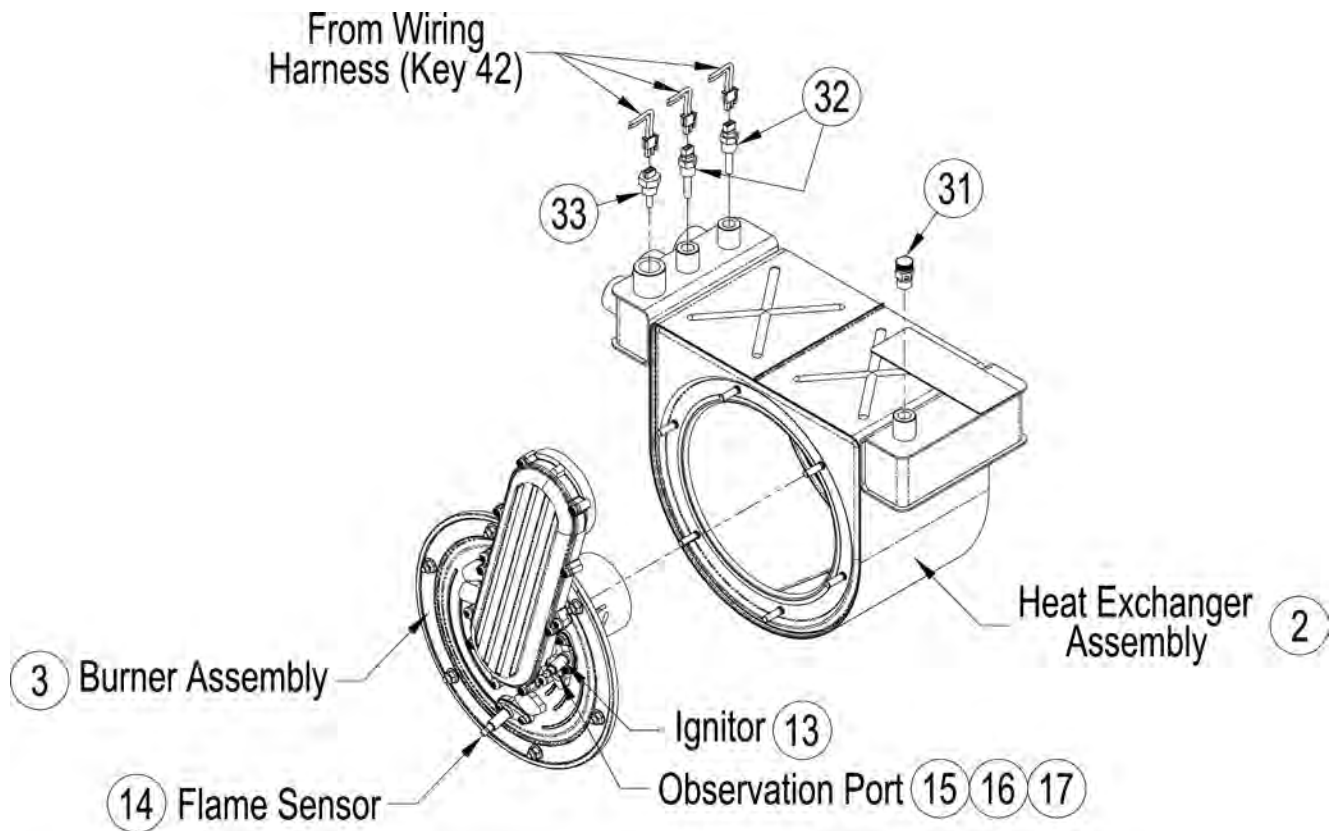
the condition that caused the lockout is corrected, the boiler will need to be manually reset using the RESET button on the display.

Table 30: Hard Lockout Codes Displayed

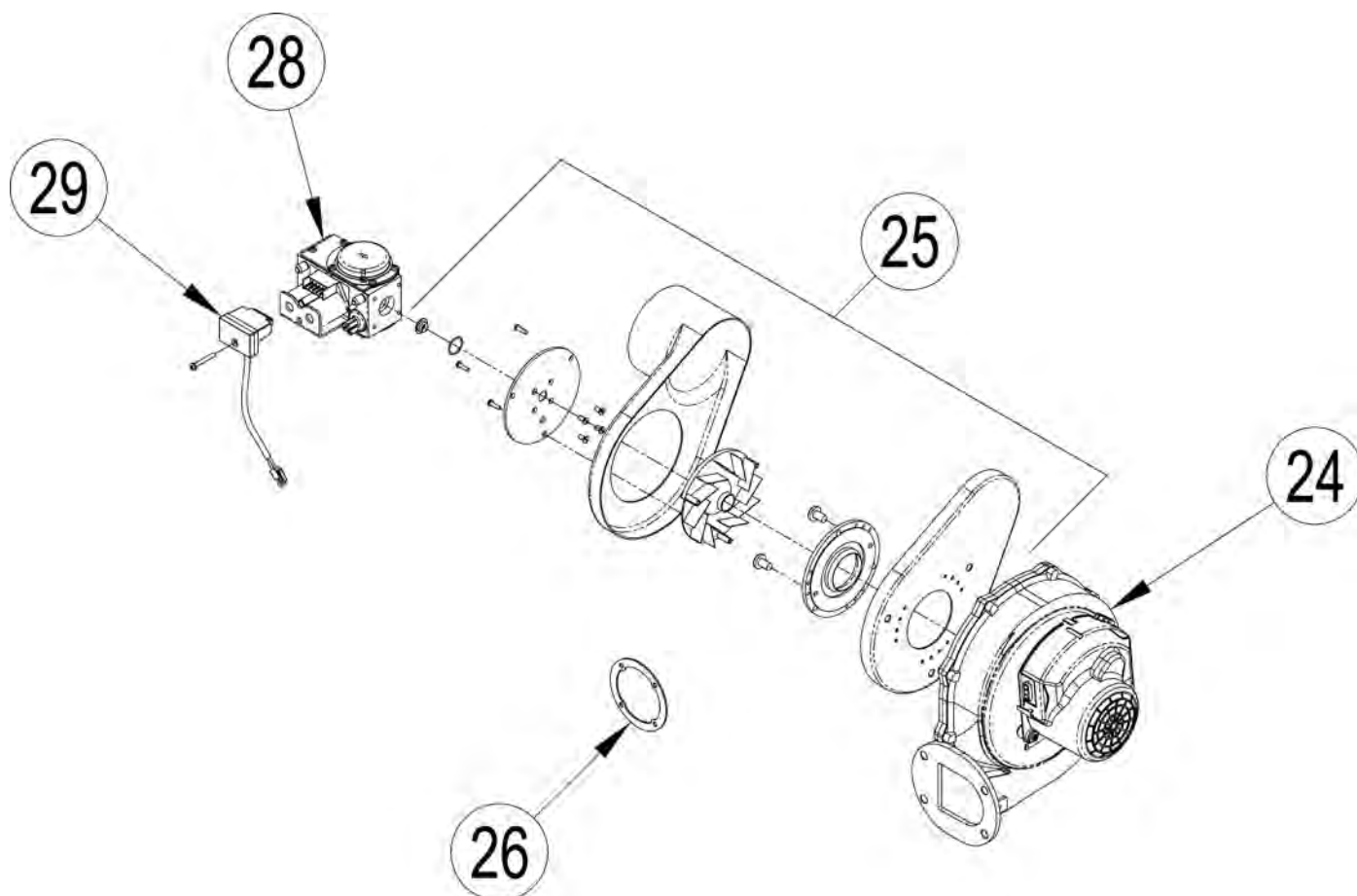
CODE	CONDITION	POSSIBLE CAUSES
E 00	A flame signal was present when there should be no flame.	<ul style="list-style-type: none"> Defective gas valve - make sure inlet pressure is below maximum on rating plate before replacing valve.
E 02	Flame failure after 5 tries to restart	<ul style="list-style-type: none"> No gas pressure Gas pressure under minimum value shown on rating plate Gas line not completely purged of air Defective Electrode Loose burner ground connection Defective Ignition Cable Defective gas valve (check for 24 VDC at harness during trial for ignition before replacing valve) Air-fuel mixture out of adjustment - consult factory
E 03	Gas valve error	<ul style="list-style-type: none"> Loose or defective gas valve harness. Check electrical connections. Defective gas valve (check for 24 VDC at harness during trial for ignition before replacing valve)
E 04	Power failure occurred after lockout	<ul style="list-style-type: none"> Some other error on this list occurred and power to the boiler was then interrupted. Reset control and see if hard lockout reoccurs.
E 05 E 06 E 07 E 11	Internal control failure	<ul style="list-style-type: none"> Reset the control. If problem reoccurs, replace the MCBA.
E 12	Low water cut-off circuit open	<ul style="list-style-type: none"> If yellow light on LWCO is on, system is low on water If neither yellow nor green light is on, check LWCO harness and check for 24VAC across AT140 transformer
E 13 E 14 E 15 E 16 E 17	Internal control failure	<ul style="list-style-type: none"> Reset the control. If problem reoccurs, replace the MCBA.
E 18	MCBA supply sensor detected temperatures in excess of 200°F for an extended period of time	<ul style="list-style-type: none"> See possible causes for “b18” error. Also, check safety limit for proper operation.
E 19	MCBA return sensor detected temperatures in excess of 200°F for an extended period of time	<ul style="list-style-type: none"> See possible causes for “b19” error.
E 28	Blower is not running when it should or fan speed signal not being detected by MCBA	<ul style="list-style-type: none"> Loose connection in 120 VAC fan wiring Loose or miswired fan speed harness Defective fan
E 29	Blower fan speed has not returned to zero rpm	<ul style="list-style-type: none"> Miswired fan speed harness Defective fan
E 31	Shorted supply temperature sensor	<ul style="list-style-type: none"> Shorted or miswired supply sensor wiring Defective supply sensor
E 32	Shorted return temperature sensor	<ul style="list-style-type: none"> Shorted or miswired return sensor wiring Defective return sensor
E 35	Flue gas temperature sensor short circuit	<ul style="list-style-type: none"> Shorted or miswired flue temp sensor wiring Defective flue temp sensor
E 36	Supply water temperature sensor circuit open	<ul style="list-style-type: none"> Loose or miswired supply sensor wiring Defective supply sensor
E 37	Return water temperature sensor circuit open	<ul style="list-style-type: none"> Loose or miswired return sensor wiring Defective return sensor
E 40	Flue gas temperature sensor circuit open	<ul style="list-style-type: none"> Loose or miswired flue temp sensor wiring Defective flue temp sensor
E 44	Internal control failure	<ul style="list-style-type: none"> Reset the control. If problem reoccurs, replace the MCBA.
E 52	Flue gas temperature over 230°F	<ul style="list-style-type: none"> Heat exchanger needs to be cleaned Boiler over-fired Air-fuel mixture out of adjustment - consult factory
E 60	Internal control failure	<ul style="list-style-type: none"> Reset the control. If problem reoccurs, replace the MCBA.

XV. Repair Parts

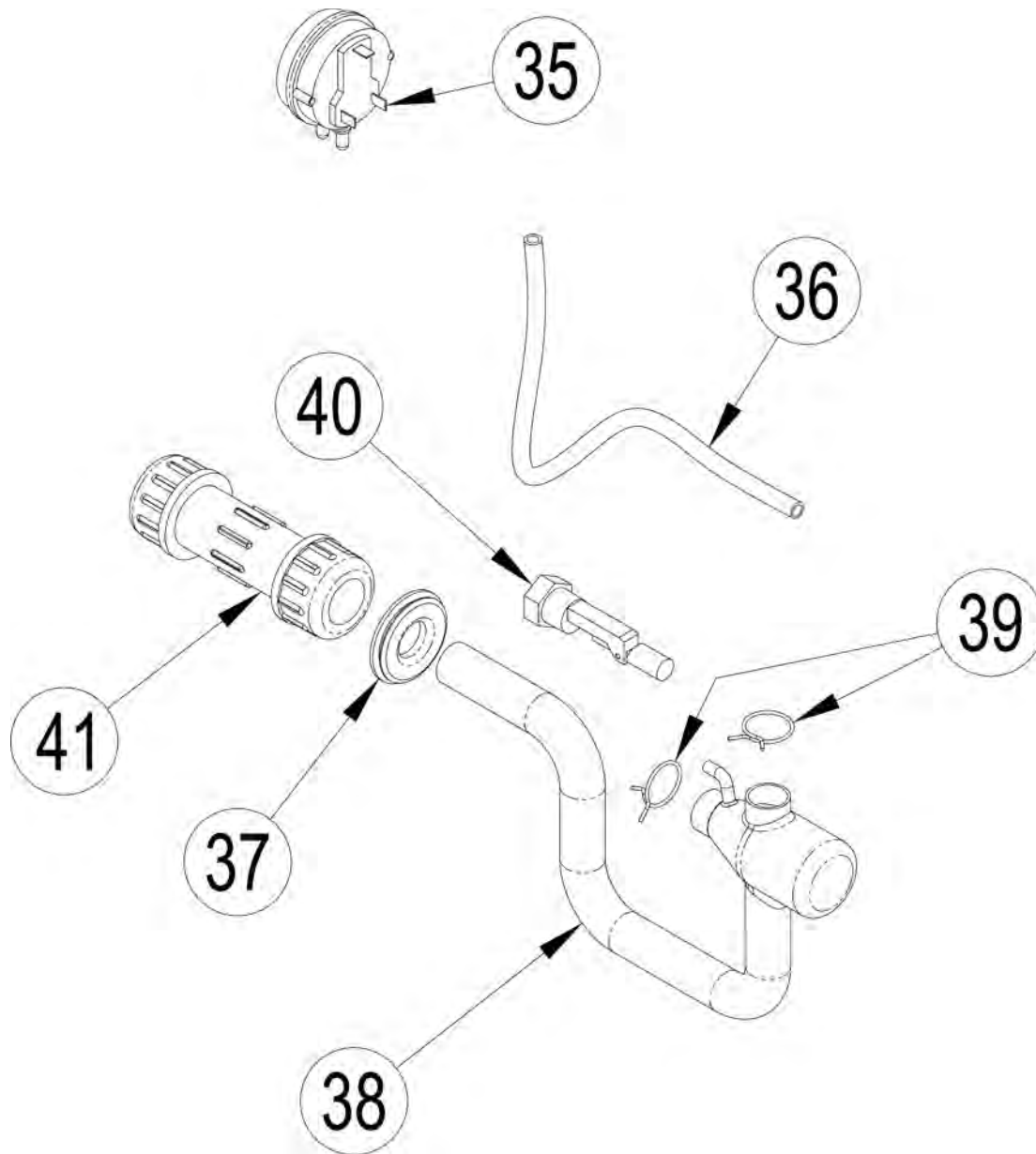
All Alpine™ Series Repair Parts may be obtained through your local Burnham Wholesale distributor. Should you require assistance in locating a Burnham distributor in your area, or have questions regarding the availability of Burnham products or repair parts, please contact Burnham Customer Service at (717) 481-8400 or Fax (717) 481-8408.



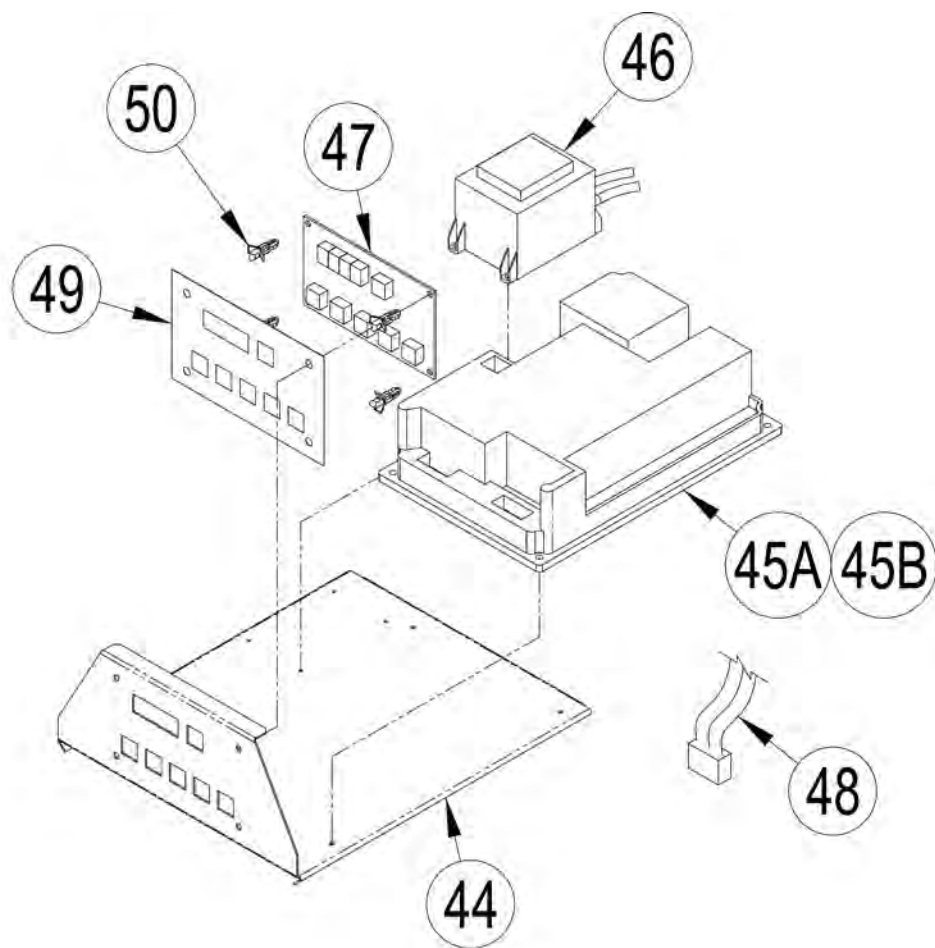
Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
1	Heat Exchanger, Burner, Etc. (Key No's 2 thru 23)	101520-01	101521-01	101522-01	101523-01	101524-01	101525-01
2	Heat Exchanger Assembly	101710-01	101711-01	101712-01	101713-01	101714-01	101715-01
3	Burner Assembly	101717-01	101718-01	101719-01	101720-01	101721-01	101722-01
4	M6x1 Hex Flange Nut (Not Shown)	(6) 101724-01					
5	Gas/Air Intake Duct Assembly (Not Shown)	101725-01			101725-02		
6	Gas/Air Intake Duct Weldment (Not Shown)	N/A					
7	Burner Plate (Not Shown)	101727-01					
8	Burner Plate Insulation (Warning: Contains RCF, Not Shown)	101728-01					
9	Burner Plate Inner Seal (Not Shown)	101729-01					
10	Burner Plate Outer Seal (Not Shown)	101730-01					
11	Burner Head (Not Shown)	101731-01	101731-02	101731-03	101731-04	101731-05	101731-06
12	Burner Head Seal (Not Shown)	101732-01					
13	Ignitor	101733-01					
14	Flame Sensor	101734-01					
15	Observation Glass Retaining Plate	101735-01					
16	Observation Glass	101736-01					
17	Observation Glass Gasket	101737-01					
18	M3x6 mm Socket Hd Thread Forming Screw, T10 Drive (Not Shown)	(2) 101738-01					
19	Ignitor Gasket (Not Shown)	101740-01					
20	Flame Sensor Gasket (Not Shown)	101741-01					
21	M4x8 mm Socket Hd Cap Thread Forming Screw, X20 Drive (Not Shown)	(4) 101739-01					
22	M5x14 mm Pan Hd Thread Forming Screw, T25 Drive (Not Shown)	101742-01					
23	Insulation Disc (Warning: Contains RCF, Not Shown)	101996-01					
31	Air Vent Valve	101586-01					
32	Water Temp Sensor	(2) 101685-01					
33	High Limit	101653-01					
42	Wire Harness (Not Shown)	101454-01					



Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
23	Gas Train Assembly (Key No's 24 thru 29)	101585-01	101585-02	101585-03	101585-04	101585-05	101585-06
24	Blower	101527-01		101528-01	101529-01	101530-01	
25	Blower Inlet Shroud Assembly	101704-01	101704-02		101704-03	101704-04	
26	Blower Outlet Gasket	101345-01					
27	Blower Mounting Plate	N/A					
28	Gas Valve	101703-01	101703-03		101703-04	101703-05	101703-06
29	Gas Valve Harness with Plug	Included with Gas Valve (Key 28)					

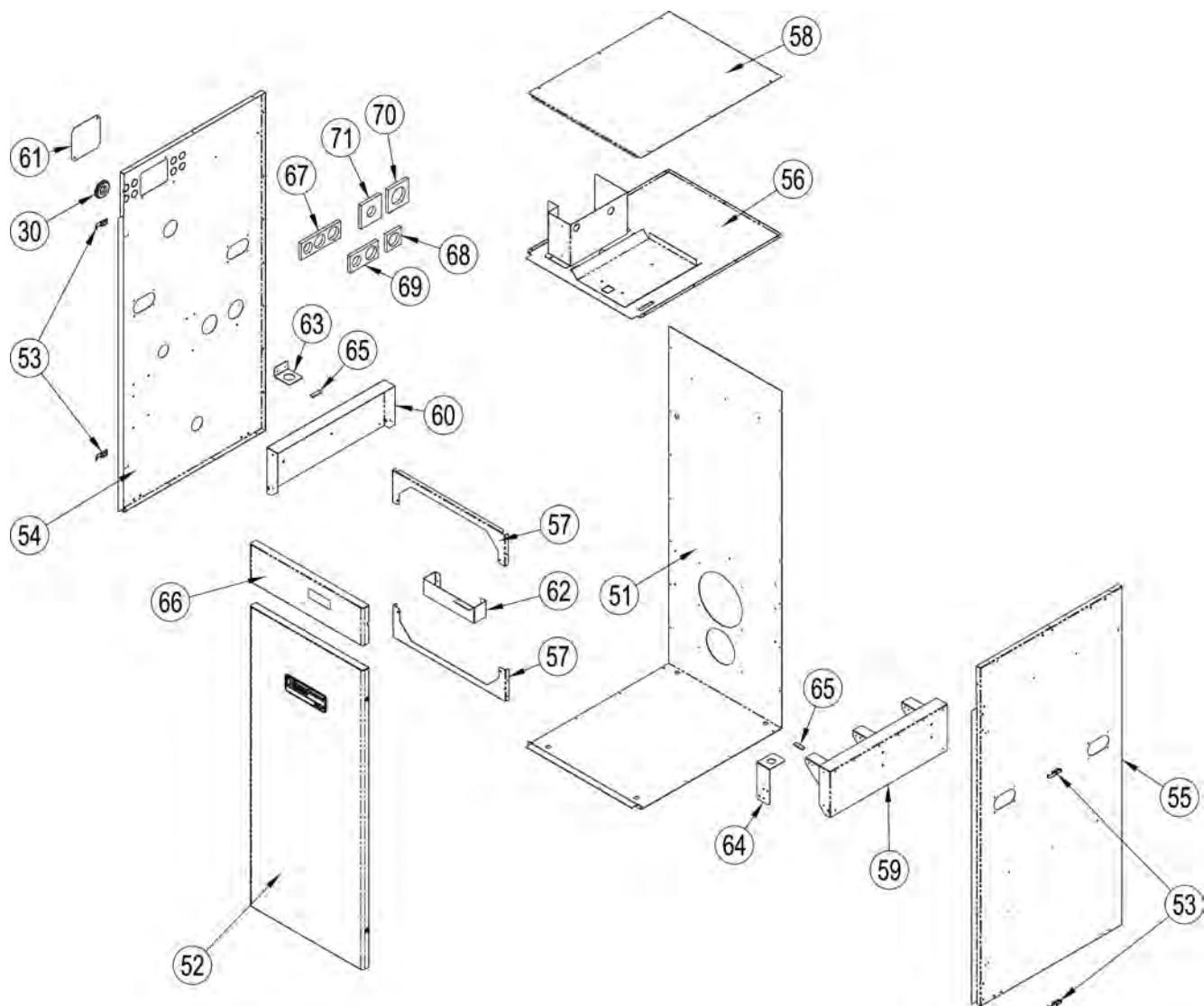


Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
35	Air Pressure Switch	80160762				101862-01	
36	Air Pressure Switch Hose	7016039				7016046	
37	Rubber Grommet, Condensate Trap	101595-01					
38	Condensate Trap, Blow Molded	101239-01					
39	Spring Clip, Condensate Trap	(2) 101632-01					
40	Blocked Condensate Drain Switch	101587-01					
41	Condensate Comp. Fitting	101546-01					

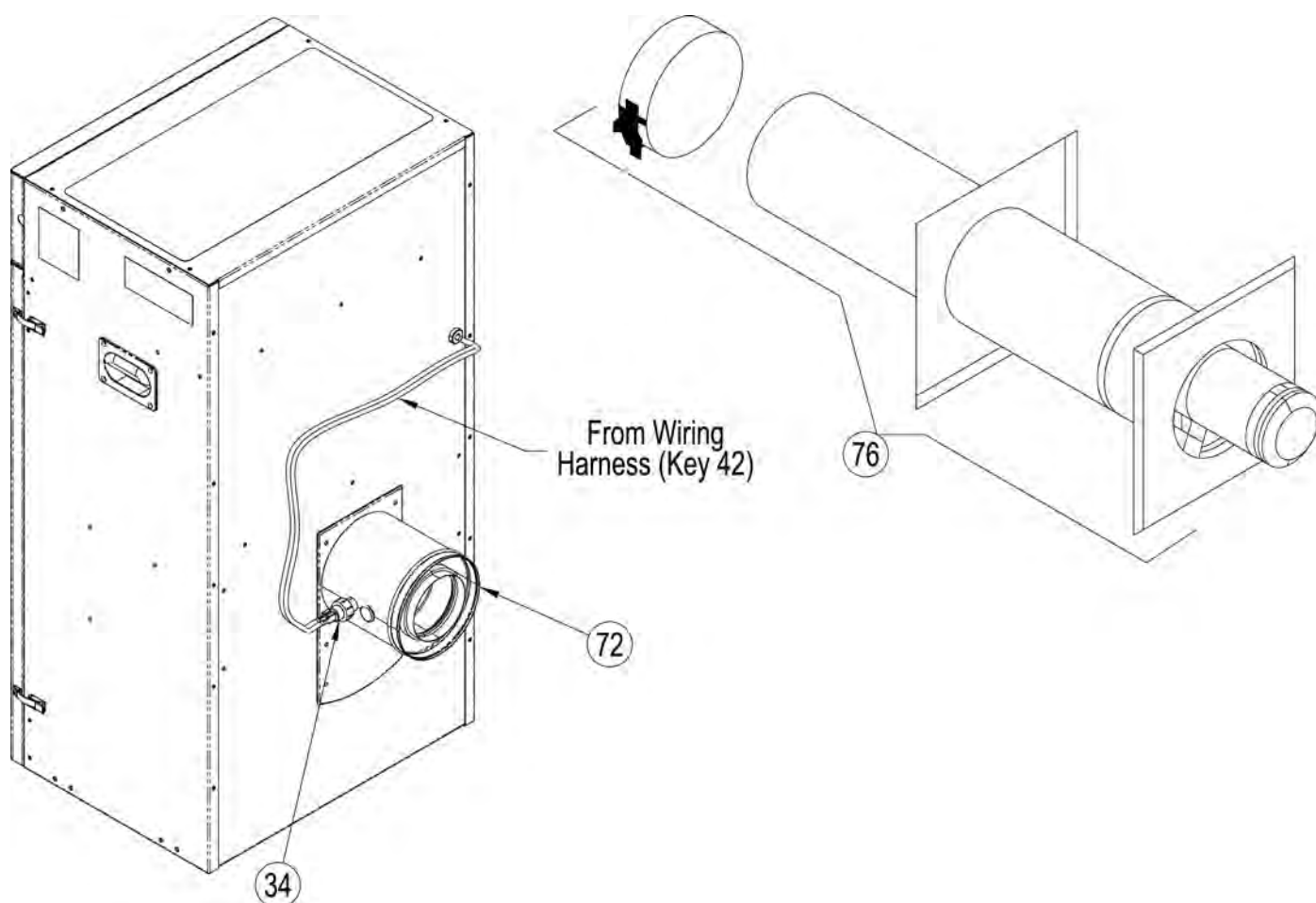


NOTE: WIRING HARNESS (KEY NO. 42) NOT SHOWN.

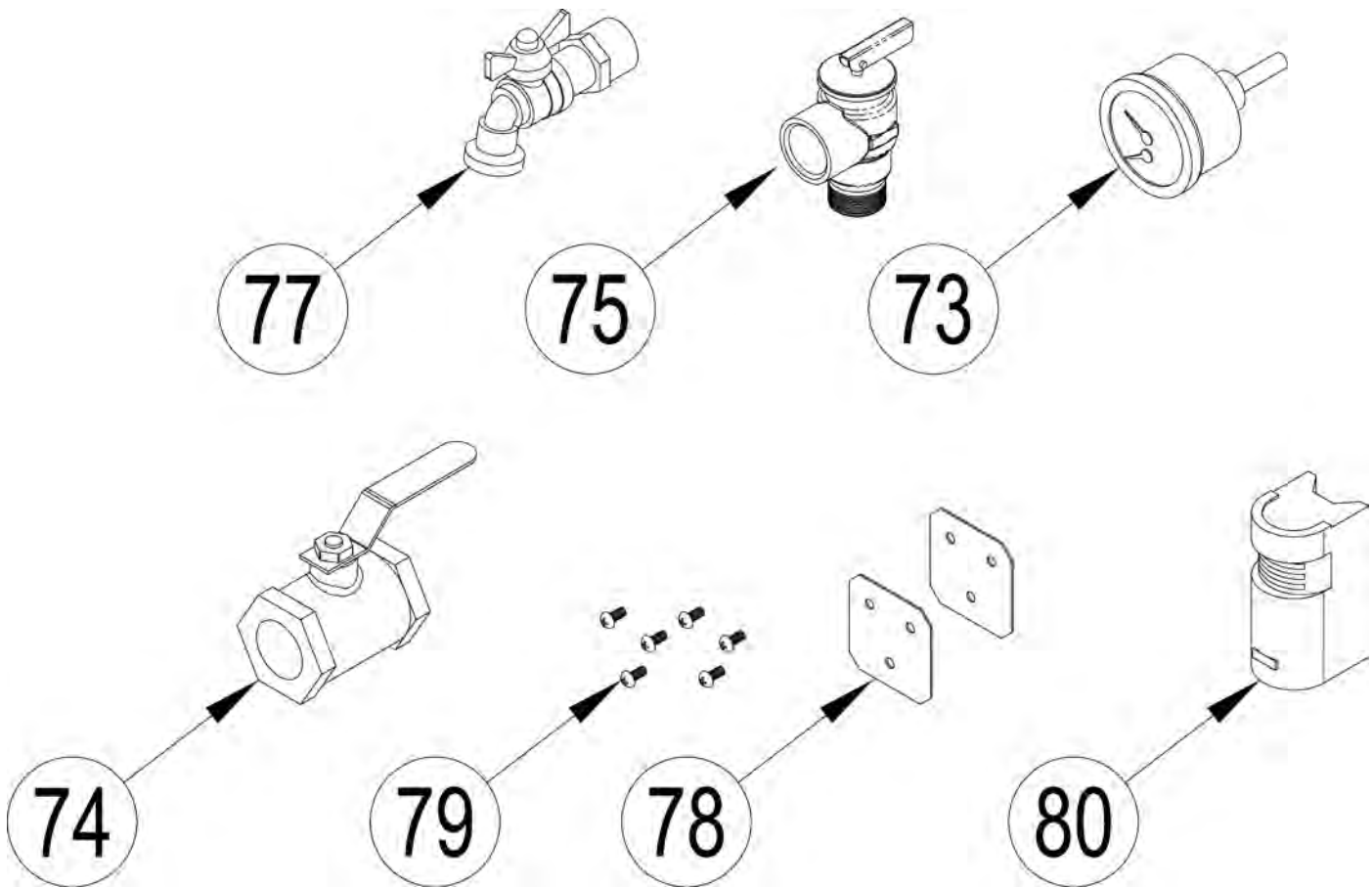
Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
42	Wiring Harness (Not Shown)	101454-01					
43	MCBA Slide Out Assembly (Includes all parts shown)	101230-01					
44	Control Panel, MCBA	101219-01					
45A	MCBA (programmed - 0-2000' or 0-7000')	101866-01	101866-02	101866-03	101866-04	101866-05	101866-06
45B	MCBA (programmed - 2001 - 7000')	101866-08	101866-09	101866-10	101866-11	N/A	
46	MCBA Transformer	100474-01					
47	MCBA Display Board	100450-01					
48	MCBA Display Board Cable	101331-01					
49	Label, MCBA Display	101609-01					
50	MCBA Display Spacer	(4) 101636-01					



Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
30	Rubber Grommet, Gas Line	820SOL0001				101638-01	
51	Jacket, Rear/Bottom Panel	101217-01	101217-02	101217-03	101217-04	101764-01	101764-02
52	Lower Front Door Assembly	101227-01				101227-02	
53	Draw Latch	101037-01					
54	Jacket, Left Side Panel	101215-01	101215-02	101215-03	101215-04	101765-01	101765-02
55	Jacket, Right Side Panel	101216-01	101216-02	101216-03	101216-04	101766-01	101766-02
56	Partition Shelf Assembly	101536-01	101536-02	101536-03	101536-04	101536-05	101536-06
57	Jacket Support Bracket	101593-01					
58	Jacket, Top Panel	101218-01	101218-02	101218-03	101218-04	101218-05	101218-06
59	Bracket Assembly, Right Side	101232-01	101232-02	101232-03	101232-04	101232-05	101232-06
60	Side Bracket	101224-01	101224-02	101224-03	101224-04	101224-05	101224-06
61	Junction Box Cover	101326-01					
62	Bracket, Rear HX Support	101381-01					
63	Bracket, Left Clip	101507-01				101507-02	
64	Bracket, Right Clip	101508-01					
65	Rubber Pad, Right Clip	101245-01					
66	Jacket, Upper Front Panel	101509-01					
67	Gasket, Header (All Three)	101240-01	N/A				
68	Gasket, Header, 1" NPT	N/A	101243-01			N/A	
69	Gasket, Header, 1" & 3/4" NPT	N/A	101252-01			N/A	
70	Gasket, Header, Duo Size	N/A				101372-02	101372-03
71	Gasket, Header, Duo Size	N/A				101372-01	



Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
34	Flue Temp Sensor	101687-01					
42	Wire Harness (Not Shown)	101454-01					
72	Concentric Vent Collar with Viton Cap	101598-01				101599-01	
76	Vent Terminal Kit	101808-01				101809-01	



Key No.	Description	(Quantity) Part Number					
		ALP080	ALP105	ALP150	ALP210	ALP285	ALP399
MISCELLANEOUS PARTS CARTON		101777-01				101777-02	101777-03
73	Temperature/Pressure Gauge	8056169					
74	External Gas Shut Off Valve	806SOL0005				101615-01	
75	Relief Valve	81660363					81660302
77	Boiler Drain Valve	806603061					
78	Boiler Stacking Brackets	(4) 101679-01					
79	Boiler Stacking Bracket Screws	(12) 80860743					
80	Outdoor Temperature Sensor	(1) 101639-01					

Important Product Safety Information

Refractory Ceramic Fiber Product

Warning:

The Repair Parts list designates parts that contain refractory ceramic fibers (RCF). RCF has been classified as a possible human carcinogen. When exposed to temperatures about 1805°F, such as during direct flame contact, RCF changes into crystalline silica, a known carcinogen. When disturbed as a result of servicing or repair, these substances become airborne and, if inhaled, may be hazardous to your health.

AVOID Breathing Fiber Particulates and Dust

Precautionary Measures:

Do not remove or replace RCF parts or attempt any service or repair work involving RCF without wearing the following protective gear:

1. A National Institute for Occupational Safety and Health (NIOSH) approved respirator
 2. Long sleeved, loose fitting clothing
 3. Gloves
 4. Eye Protection
- Take steps to assure adequate ventilation.
 - Wash all exposed body areas gently with soap and water after contact.
 - Wash work clothes separately from other laundry and rinse washing machine after use to avoid contaminating other clothes.
 - Discard used RCF components by sealing in an airtight plastic bag. RCF and crystalline silica are not classified as hazardous wastes in the United States and Canada.

First Aid Procedures:

- If contact with eyes: Flush with water for at least 15 minutes. Seek immediate medical attention if irritation persists.
- If contact with skin: Wash affected area gently with soap and water. Seek immediate medical attention if irritation persists.
- If breathing difficulty develops: Leave the area and move to a location with clean fresh air. Seek immediate medical attention if breathing difficulties persist.
- Ingestion: Do not induce vomiting. Drink plenty of water. Seek immediate medical attention.

Limited Warranty

FOR RESIDENTIAL GRADE STAINLESS STEEL WATER BOILERS

Subject to the terms and conditions set forth below, U.S. Boiler Company, Inc. Lancaster, Pennsylvania hereby extends the following limited warranties to the original owner of a residential grade stainless steel water boiler manufactured and shipped on or after November 1, 2007:

ONE YEAR LIMITED WARRANTY ON RESIDENTIAL STAINLESS STEEL GRADE WATER BOILERS

U.S. Boiler Company, Inc. warrants to the original owner that its residential grade stainless steel water boilers comply at the time of manufacture with recognized hydronic industry standards and requirements then in effect and will be free of defects in material and workmanship under normal usage for a period of one year from the date of original installation. If any part of a stainless steel water boiler is found to be defective in material or workmanship during this one year period, U.S. Boiler Company, Inc. will, at its option, repair or replace the defective part.

TWELVE YEAR LIMITED WARRANTY ON HEAT EXCHANGER

The second through 7th year warranty covers only the heat exchanger. All other component parts furnished by U.S. Boiler Company, Inc., but purchased from other manufacturers, shall be limited to their warranties, if any.

U.S. Boiler Company, Inc. warrants to the original owner and at its original place of installation that the heat exchanger of its residential grade stainless steel water boilers will remain free from defects in material and workmanship under normal usage for seven years. If a claim is made under this warranty during the first seven years from the date of original installation, U.S. Boiler Company, Inc. will, at its option, repair or replace the heat exchanger. If a claim is made under this warranty after the expiration of seven years and up to twelve years from the date of original installation, U.S. Boiler Company, Inc. will, at its option and upon payment of the pro-rated service charge set forth below, repair or replace the stainless steel heat exchanger. The service charge applicable to a stainless steel heat exchanger warranty claim is based upon the number of years the heat exchanger has been in service and will be determined as a percentage of the retail price of the heat exchanger model involved at the time the warranty claim is made as follows:

Years in Service	1-7	8	9	10	11	12	13 +
Service Charge as % of Retail Price	No Charge	30	40	50	60	70	100

NOTE: If the heat exchanger model involved is no longer available due to product obsolescence or redesign, the value used to establish the retail price will be the published price as shown in the Burnham Hydronics Repair Parts Price Sheet where the heat exchanger last appeared or the current retail price of the then nearest equivalent heat exchanger.

ADDITIONAL TERMS AND CONDITIONS

- 1. Applicability:** The limited warranties set forth above are extended only to the original owner at the original place of installation within the United States and Canada. These warranties are applicable only to stainless steel water boilers designated as residential grade by U.S. Boiler Company, Inc. and installed in a single or two-family residence and do not apply to steam boilers of any kind, any application other than for space heating or to commercial grade boilers.
- 2. Components Manufactured by Others:** Upon expiration of the one year limited warranty on residential grade stainless steel water boilers, all boiler components manufactured by others but furnished by U.S. Boiler Company, Inc. (such as burners, gas valves and controls) will be subject only to the manufacturer's warranty, if any.
- 3. Proper Installation:** The warranties extended by U.S. Boiler Company, Inc. are conditioned upon the installation of the residential grade stainless steel water boiler in strict compliance with U.S. Boiler Company, Inc. installation instructions. U.S. Boiler Company, Inc. specifically disclaims liability of any kind caused by or relating to improper installation.
- 4. Proper Use and Maintenance:** The warranties extended by U.S. Boiler Company, Inc. conditioned upon the use of the residential grade stainless steel water boiler for its intended purposes and its maintenance in accordance with U.S. Boiler Company, Inc. requirements and hydronics industry standards.
- 5. This warranty does not cover the following:**
 - a. Expenses for removal or re-installation. The homeowner will be responsible for the cost of removing and reinstalling the alleged defective part or its replacement and all labor and material connected therewith, and transportation to and from U.S. Boiler Company, Inc.
 - b. Components that are part of the heating system but were not furnished by U.S. Boiler Company, Inc., as part of the residential boiler.
 - c. Improper burner adjustment, control settings, care or maintenance.
 - d. This warranty cannot be considered as a guarantee of workmanship of an installer connected with the installation of the U.S. Boiler Company, Inc. boiler, or as imposing on U.S. Boiler Company, Inc. liability of any nature for unsatisfactory performance as a result of faulty workmanship in the installation, which liability is expressly disclaimed.

- e. Boilers installed outside the 48 contiguous United States, the State of Alaska, and Canada.
 - f. Damage to the boiler and/or property due to installation or operation of the boiler that is not in accordance with the boiler installation and operating instruction manual.
 - g. Any damage of failure of the boiler resulting from hard water or scale buildup in the heat exchanger.
 - h. Any damage caused by improper fuels, fuel additives or contaminated combustion air that may cause fireside corrosion and/or clogging of the burner or heat exchanger.
 - i. Any damage resulting from combustion air contaminated with particulate which cause clogging of the burner or combustion chamber including but not limited to sheetrock or plasterboard particles, dirt, and dust particulate. (See Air Ventilation section of the Installation and Operating Manual furnished with the unit)
 - j. Any damage, defects or malfunctions resulting from improper operation, maintenance, misuse, abuse, accident, negligence including but not limited to operation with insufficient water flow, improper water level, improper water chemistry, or damage from freezing. (See System Piping, Start up and Checkout, Operation and Service and Maintenance sections of the Installation and Operating Manual furnished with the unit)
 - k. Any damage caused by water side clogging due to dirty systems or corrosion products from the system. (See System Piping section of the Installation and Operating Manual furnished with the unit)
 - l. Any damage resulting from natural disaster.
 - m. Damage or malfunction due to the lack of required maintenance outlined in the Service and Maintenance section of the Installation and Operating Manual furnished with the unit.
6. **Exclusive Remedy:** U.S. Boiler Company, Inc. obligation for any breach of these warranties is limited to the repair or replacement of its parts in accordance with the terms and conditions of these warranties.

7. **Limitation of Damages:** Under no circumstances shall U.S. Boiler Company, Inc. be liable for incidental, indirect, special or consequential damages of any kind whatsoever under these warranties, including, but not limited to, injury or damage to persons or property and damages for loss of use, inconvenience or loss of time. U.S. Boiler Company, Inc. liability under these warranties shall under no circumstances exceed the purchase price paid by the owner for the residential grade water boiler involved. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

8. **Limitation of Warranties:** These warranties set forth the entire obligation of U.S. Boiler Company, Inc. with respect to any defect in a residential grade stainless steel water boiler and U.S. Boiler Company, Inc. shall have no express obligations, responsibilities or liabilities of any kind whatsoever other than those set forth herein. These warranties are given in lieu of all other express warranties.

ALL APPLICABLE IMPLIED WARRANTIES, IF ANY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY LIMITED IN DURATION TO A PERIOD OF ONE YEAR EXCEPT THAT IMPLIED WARRANTIES, IF ANY, APPLICABLE TO THE HEAT EXCHANGER IN A RESIDENTIAL STAINLESS STEEL GRADE WATER BOILER SHALL EXTEND TO THE ORIGINAL OWNER FOR A MAXIMUM OF TWELVE YEARS AT THE ORIGINAL PLACE OF INSTALLATION. SOME STATES DO NOT ALLOW LIMITATION ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

PROCEDURE FOR OBTAINING WARRANTY SERVICE

In order to assure prompt warranty service, the owner is requested to complete and mail the attached Warranty Card within ten days after the installation of the boiler, although failure to comply with this request will not void the owner's rights under these warranties.

Upon discovery of a condition believed to be related to a defect in material or workmanship covered by these warranties, the owner should notify the installer, who will in turn notify the distributor. If this action is not possible or does not produce a prompt response, the owner should write to U.S. Boiler Company, Inc., Burnham Hydronics, at P.O. Box 3079, Lancaster, PA 17604, giving full particulars in support of the claim.

The owner is required to make available for inspection by U.S. Boiler Company, Inc. or its representative the parts claimed to be defective and, if requested by U.S. Boiler Company, Inc. to ship these parts prepaid to U.S. Boiler Company, Inc. at the above address for inspection or repair. In addition, the owner agrees to make all reasonable efforts to settle any disagreement arising in connection with a claim before resorting to legal remedies in the courts.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.



10/07